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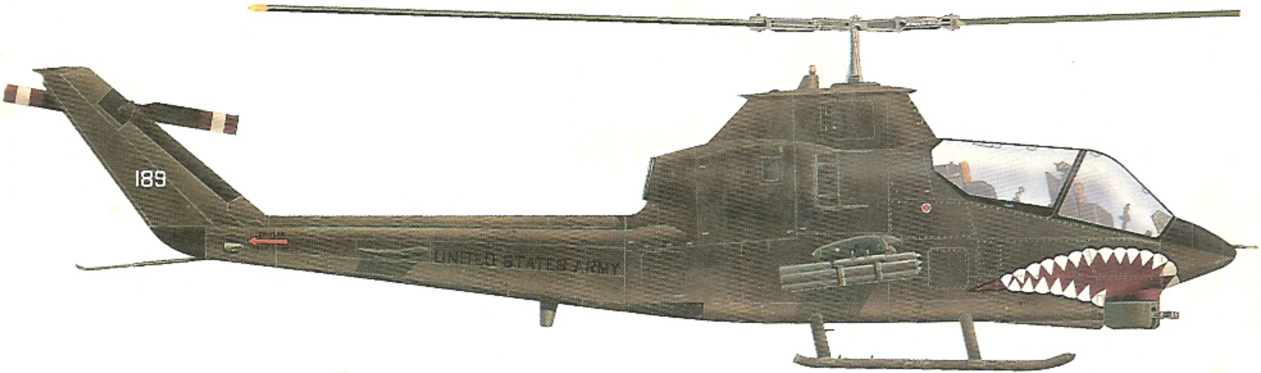
AH-1 HueyCobra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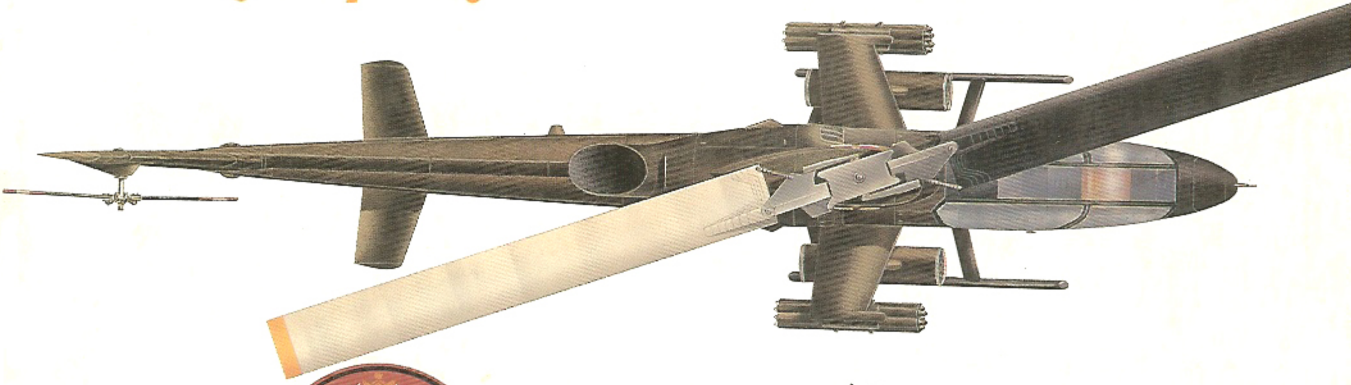

LINDSAY PEACOCK

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COMBAT AIRCRAFT SERIES

AH-1
HueyCobra

LINDSAY PEACOCK

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LINDSAY PEACOCK is an aviation journalist and photographer who has written extensively on military aircraft subjects for books and magazines, especially in areas of specific interest to aircraft modellers. He has travelled widely in pursuit of his profession and hobbies, and spent much time at military aircraft establishments observing his subjects at close quarters. His other books in this series are *F/A-18 Hornet, F-14 Tomcat, B-52 Stratofortress* and *AH-1 HueyCobra.*

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1

Evolution of the HueyCobra

NOW ASSURED of a secure place in aviation history as the first dedicated attack helicopter to enter service anywhere in the world, the Bell HueyCobra has, like other members of the hugely successful H-1 family of rotary-wing craft, demonstrated remarkable growth potential in the two decades which have elapsed since it made its combat début in Vietnam. Still in production at the time of writing, its capability has been expanded out of all recognition when compared with the initial AH-1G, new weaponry such as the TOW missile and new sensors having been successfully incorporated, and some variants having also benefited from the provision of twin-engine safety.

Examples of the "Cobra" may be found throughout the world. The type serves with both the US Army and the US Marine Corps in considerable numbers, and it has also been exported to such countries as Iran, Israel, Japan, Pakistan and Spain. As a dollar earner, it has made a significant contribution to the US balance of payments and yet, had it not been for the Vietnam War, it is doubtful whether it would even have appeared in the first place. It is often the case in time of war, however, that the development of an aircraft, once begun, is carried through remarkably swiftly, and barely two years elapsed between the HueyCobra's maiden flight and its introduction to combat duty in South Vietnam.

The evolutionary process which culminated in the Bell Model 209, as it is known to the manufacturer, can be traced back to about the middle of the previous decade. It was in many ways a multi-stranded affair. The impetus for the "gunship" helicopter concept originated within the US Army itself, the service conducting limited experimentation with existing types which were not, in truth, well suited to the task. Ultimately, it required the US aerospace industry to formulate the gunship's definitive expression and this duly came about when

Below: Continued refinement of the world's first dedicated battlefield helicopter has led to the AH-1S, the current US Army variant of the formidable HueyCobra.

Bell—then, as now, perhaps the most successful helicopter manufacturing company in the world—began to direct its energies towards a solution in the early 1960s. Army experience and Bell expertise culminated in the HueyCobra, a deadly opponent and one that the Viet Cong soon learned to treat with great respect.

A youthful concept

Although the helicopter had succeeded in making the transition from being viewed largely as a novel means of travelling around the sky to a machine capable of performing a useful combat role during the course of the Korean War, the end of that conflict more or less signalled an end to the evolution of rotary-wing craft as far as battlefield application was concerned. Part of the reason for this lay in the fact that the helicopter was still a relatively youthful concept and, certainly, most of the early machines were frail, under-powered and fit for little more than ancillary missions such as observation and casualty evacuation. The speedy withdrawal of wounded personnel was often a matter of life or death for the victims, but in terms of affecting an overall battle plan it achieved little. Artillery direction and monitoring the fall of shot was undoubtedly of much greater value in the actual conduct of a campaign, but here also the helicopters employed were exceedingly vulnerable to enemy fire and great caution had to be exercised when they were operating in the vicinity of opposing forces. In view of this, those early pioneers who advocated the concept of heavily armed and armoured battlefield interdiction helicopters were given short shrift, being perceived largely as eccentrics.

By the latter part of the 1950s, the continuing development of the helicopter had resulted in far more suitable machines becoming available, most notably in the United States where types such as the Sikorsky H-34 and Piasecki (Vertol) H-21 regularly demonstrated that they clearly had a part to play in the conduct of any future war. Nevertheless, most of those in authority still looked upon the rotary-wing craft as being principally a means of enhancing the mobility of troops in battle or of resupplying friendly forces engaged in combat. Certainly, scant consideration was given to employing the helicopter as a weapon in itself, those who had the vision to contemplate the potential of this still revolutionary concept experiencing great difficulty in finding ears sympathetic to their cause.

It was against this largely unfavourable background that a small group of men began work in the summer of 1956. Brig. Gen. Carl Hutton, commandant of the Army's Fort Rucker, Alabama based Aviation School, had sufficient belief in the possibilities to provide encouragement and a limited amount of backing to Col. Jay Vanderpool, then head of the School's Combat Development Office. Even then, though, early trials with armed helicopters were conducted on rather "hole in the corner" lines, Vanderpool having little going for him except almost unbounded enthusiasm. Money, backing from the higher elements of the Army chain of command and publicity were all denied to him and his handful of personnel, although he did at least have the various School assets to draw on if necessary. As far as dedicated helicopters with which to experiment were concerned, these too were hard to obtain, and Vanderpool had to scrounge whatever he could, from various sources, legitimate and illegitimate.

"Sky-Cav" platoon

Having started work in somewhat haphazard fashion by the simple expedient of tying a machine gun on a Bell H-13 Sioux observation helicopter, Vanderpool had managed, by mid-1957 (barely 12 months after beginning his experiments), to gather together a motley fleet of helicopters which included a single example of the H-19 Chickasaw, a couple of H-21 Shawnees and one H-25 Army Mule. It was not exactly an inspiring collection, but it was soon hard at work with the so-called "Sky-Cav" platoon, this being a temporary organisation made up of personnel loaned from the Fort Rucker School's tactics department.

Needless to say, the early experiments with armament were not without an element of risk—indeed, some of those most closely associated with the various trials projects would probably use rather stronger language to describe the often hair-raising escapades experienced at Fort Rucker. Many of the early tests were "Heath Robinson" affairs, but this does not detract from the fact that much of the work undertaken at this time was put to good use several

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Above: Representing the many thousands of utility Iroquois that were manufactured by the parent company, a UH-1D flies low over the ground at a European air display in the 1970s.

years later. In fact, it could be said that Vanderpool's team to some extent wrote the manuals which were ultimately used in the art of "aerial reconnaissance by fire", an art which many would say was refined almost to the point of perfection in Vietnam during the following decade.

Eventually, of course, news of the work of this small team began to filter through to those occupying the more rarified levels of command, and by the summer of 1957 the whole organisation was put on a more formal footing, it then being known as the Aerial Combat Reconnaissance Platoon. This, however, proved to be a short-lived designation, for it was changed in late March 1958 to the rather more specific title of 7292nd Aerial Combat Reconnaissance Company (Provisional), a change which, one assumes, was accompanied by the allocation of funding for further experiment, for study into the potential of the armed helicopter and, perhaps most important of all, for consideration of how best to incorporate it into Army tactical doctrine. Thus, by the beginning of the 1960s, the concept of the armed helicopter had taken a firm hold and was no longer viewed as a mere pipe-dream—all that was needed was a suitable machine on which to hang armament, and this, too, was not long in coming.

In 1960, Bell's Model 204 utility helicopter was still very much in the early stages of deployment with elements of the US Army, and it is doubtful if there were many who foresaw that it would soon become the cornerstone of Army aviation. Unique in being the first turbine-powered rotary-wing craft to join that service, it began life in the early 1950s when the Army identified a requirement for a machine capable of performing the "casevac" (casualty evacuation) mission, with a secondary utility function. Initially designated H-40, what eventually evolved into the Iroquois made its maiden flight in October 1956, and testing the prototype and a number of preproduction machines resulted in the first of a series of orders for production examples, these being designated HU-1A.

UH-1 production

Series manufacture of this first model was modest, just under 200 examples being completed before production switched to the HU-1B, these two variants being redesignated UH-1A and UH-1B respectively in 1962 when the unified nomenclature system was introduced. In the event, UH-1B production exceeded the 1,000 mark, and close to 800 UH-1Cs were also completed before the stretched UH-1D (Bell Model 205) began to join Army units in quantity.

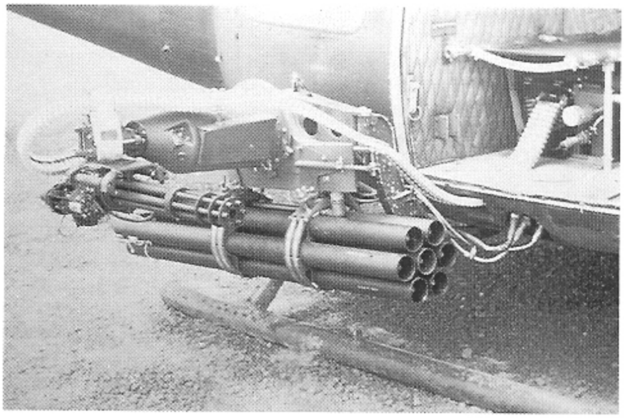
Not surprisingly, both the UH-1A and the UH-1B were very soon introduced to combat in South-East Asia. The first Hueys arrived in early 1962, although the quantity involved remained at a fairly modest level until US involvement in Vietnam began to increase in the summer of 1964. Almost from the outset, these helicopters were fitted with armament, a pair of 0.30-calibre machine guns and 2.75in rocket launchers being installed on a number of UH-1A Hueys for use in the fire suppression role when escorting troop-carrying "slicks" such as the veteran CH-21 Shawnees which intially fulfilled this function. Later, when the UH-1B began to reach the theatre, four M60 machine guns were fitted in place of the original two-gun installation.

As combat experience grew, it became evident that the armed Iroquois, even though it possessed a powerful punch, was vulnerable to ground fire put up by determined opponents. Clearly, some kind of dedicated battlefield helicopter—possessing greater speed and manœuvrability, armour protection and considerably heavier firepower—was fast becoming a necessity, and in view of this it was hardly startling news when Bell revealed that it was looking into the possibility of developing such a machine.

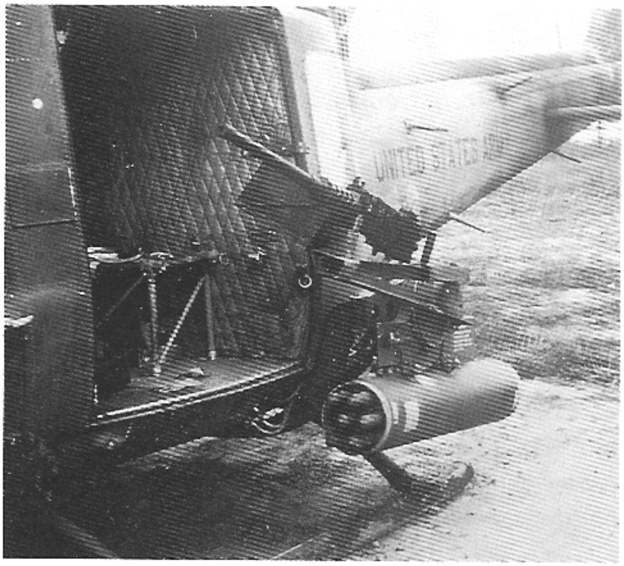
Advanced Aerial Fire Support System

At about the same time, US Army concern over the vulnerability of the helicopter in combat also prompted research into the possibility of obtaining a new type to serve in the fire-support role, concern which eventually led to the service circulating industry for proposals for what became known as the Advanced Aerial Fire Support System (AAFSS). A request for proposals to meet this need was formally issued on 1 August 1964, and after studying a number of submissions the Army selected Lockheed's AH-56 as being most suitable, the announcement on 1 November 1965 being accompanied by the award of a contract for a batch of ten prototypes, the first of which was expected to take to the air in early 1967.

In the meantime, of course, there was still the short-term problem to be faced in Vietnam, where the Chinook was now the principal transport helicopter. Possessing a top speed almost 50mph faster than that of the UH-1B which was assigned to escort it, the Chinook crews faced a dilemma. It was obviously desirable to utilise the type's superior performance to the maximum advantage, since this naturally reduced the amount of time during which the helicopter might be exposed to ground fire. However, when operating at maximum cruising speed, the Chinooks had to go about their duties unescorted, because the Iroquois was quite simply unable to keep up. Alternatively, the Chinooks could slow down to take advantage of the protection offered by the fairly heavily armed UH-1s, although this in turn lengthened the amount of time that they were exposed to ground fire, often with tragic results. Neither solution was satisfactory, and it was apparent to even the most blinkered observer that an interim AAFSS type was badly needed, if only to cut down the combat losses, which were beginning to rise to alarming levels. In consequence, the Army elected to take a closer look at existing production



Above: One of the many armament combinations applied to the Iroquois in the Vietnam War comprised the M21 Minigun and the XM-158 2.75in forward-firing aerial rocket pack.



Above: With six of the seven tubes loaded, the XM-158 FFAR pack was extensively used in combat. A 0.5-calibre machine gun is also fitted to this example of the Iroquois.

helicopters in the hope that something could be obtained to "fill the gap" until Lockheed's Cheyenne began to reach Army units in quantity.

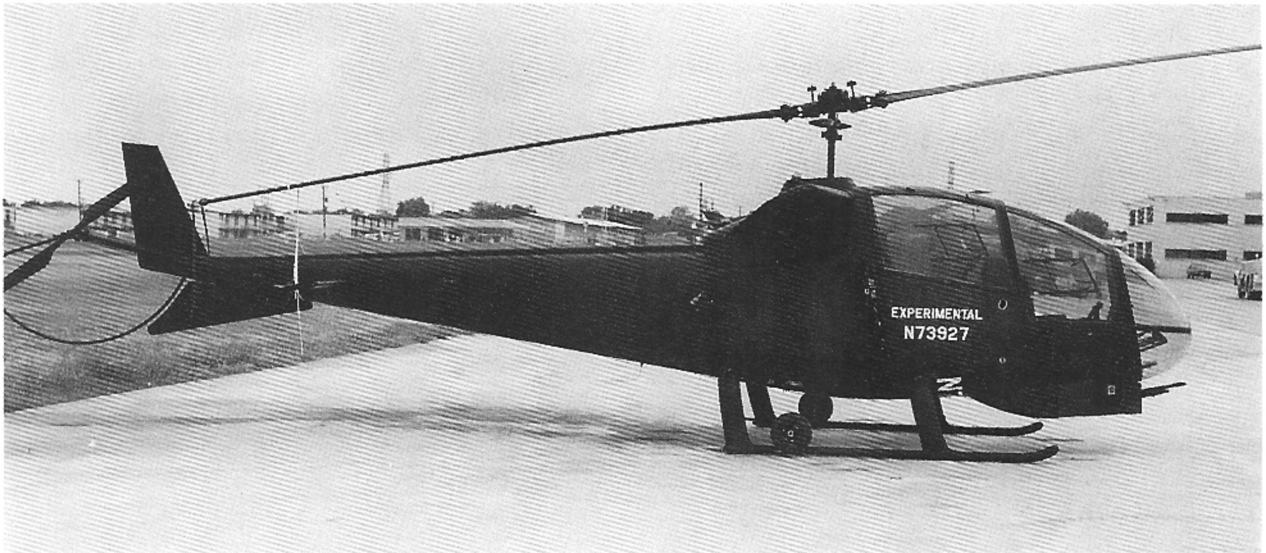
During the latter part of 1965, therefore, Col. H. L. Bush assumed control of a specially convened committee to look into the various candidates. There were four main proposals on offer—a modification of the Chinook itself, variants of the Navy's Kaman UH-2A Seasprite and Sikorsky SH-3 Sea King, and, most radical of all (and probably ideal), Bell's Model 209 derivative of the Iroquois. The key criteria for the so-called "Bush Board" were high speed, a good payload capability and, last but by no means least, the availability of such a machine for combat duty within 18–24 months. All four candidates satisfied the last requirement, but the armament options, cost and performance characteristics varied significantly.

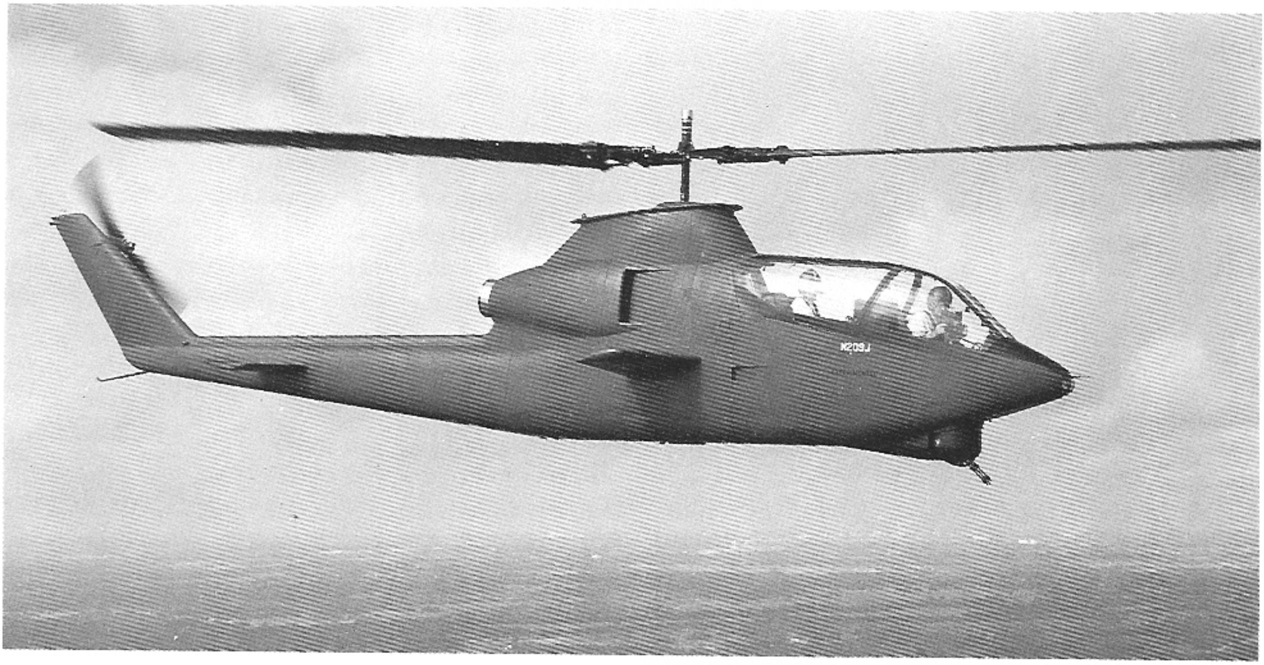
The Sioux Scout

For Bell, this interim project seemed to be a heaven-sent opportunity, since the company had been actively studying the battlefield helicopter concept since mid-1963. Its initial studies were wide-ranging, one proposal being purely and simply a derivative of the UH-1 known as the Warrior, and another a vastly modified Bell 47, which the company began testing later that year and which was apparently known as the OH-13X Sioux Scout. Given the company designation Model 207, this incorporated a tandem two-seat cockpit in much the same way as would the later AH-1, and the armament evaluated by the sole prototype conversion comprised an Emerson Electric TAT-101 chin turret housing a pair of 0.30in (7.62mm) machine guns. In reality, the Sioux Scout was always a "non-starter", because its performance and payload shortcomings left too much to be desired, and it is doubtful whether it was ever viewed by Bell as a serious contender, probably being intended more as a proof-of-concept vehicle. In this respect it certainly succeeded, and the experience gained in flight-testing the OH-13X undoubtedly helped when it came to formulating the HueyCobra proposal.

The project which eventually evolved into the HueyCobra was the Model 209, which was initially undertaken as a private venture and predated the convening of the "Bush Board" by some months. In what quickly became a top-priority programme, Bell opted to utilise as many features of the standard utility Huey as possible rather than start with a clean sheet of paper. Thus, although what emerged was startlingly different in appearance, the resulting HueyCobra did bear strong family ties with the Iroquois family, commonality reportedly being of the order of 85 per cent; it is for this reason that it shares the basic H-1 designation with its rather more portly troop-carrying counterparts.

Below: Known by Bell as the OH-13X Sioux Scout, the company's Model 207 bore little more than a passing similarity to the Model 47 from which it evolved. Major changes were made with regard to crew accommodation, the two occupants being seated in tandem in an extensively glazed cockpit. Armament consisted of a single Emerson Electric TAT-101 chin turret housing two 0.30in machine guns. Much useful experience was gained from this machine.





Above: The HueyCobra's clean lines are readily apparent in this in-flight study of the privately funded prototype.

In essence, the transmission, rotor system and powerplant of the UH-1C was taken as a starting point, Bell designers coming up with a drastically revised fuselage of much narrower frontal aspect which not only made it much harder to detect visually but also harder to hit, whilst at the same time being aerodynamically much "cleaner", with concomitant performance benefits. In addition, the HueyCobra retained the familiar skid-type undercarriage members that were virtually the trade mark of Bell designs, these being retractable on the prototype although fixed on subsequent production specimens.

Ordnance hardpoints

Naturally, considerable attention was paid to the vital matter of armament, one wholly new feature being a pair of stub wings incorporating four hardpoints for the carriage of a variety of types of ordnance, one of the options most commonly used in Vietnam being pod-mounted 2.75in (69.85mm) rockets (19 rockets per pod, for a total of 76). As for accommodation, the Model 209 carried only the minimum number of personnel required to do the job for which it was designed, namely a pilot to fly it and a gunner to operate the various weapons systems. Learning from the earlier Sioux Scout, the two crewmen were seated in tandem in an armour-plated cockpit, the gunner being located in front so as to get the best possible field of view.

The construction of the privately funded prototype—appropriately given the civil registration N209J—forged ahead during the summer of 1965 and culminated in a successful maiden flight on 7 September that year, fortuitously at about the same time as the "Bush Board" got down to work. Early tests with this machine revealed that it possessed considerable promise, its performance being substantially superior to that of the standard Huey and to that of most of its competitors, and the Army's evaluation of the various contenders resulted in the announcement on 11 March 1966 that it considered the Bell proposal most suitable for use as an interim gunship helicopter pending the arrival of the Lockheed AH-56 Cheyenne AAFSS later in the decade.

The Army's announcement was followed on 4 April by a contract for a pair of pre-production helicopters, designated AH-1G, and, nine days later, by the first production order, this covering the supply of an initial batch of 112 HueyCobras to be procured with Fiscal Year 1966 (FY66) funding. Later contracts, placed in FY67 to FY71, raised the quantity of AH-1Gs purchased to well over 1,000, some AH-1Gs also finding their way to the US Marine Corps, to Israel and to Spain.

2

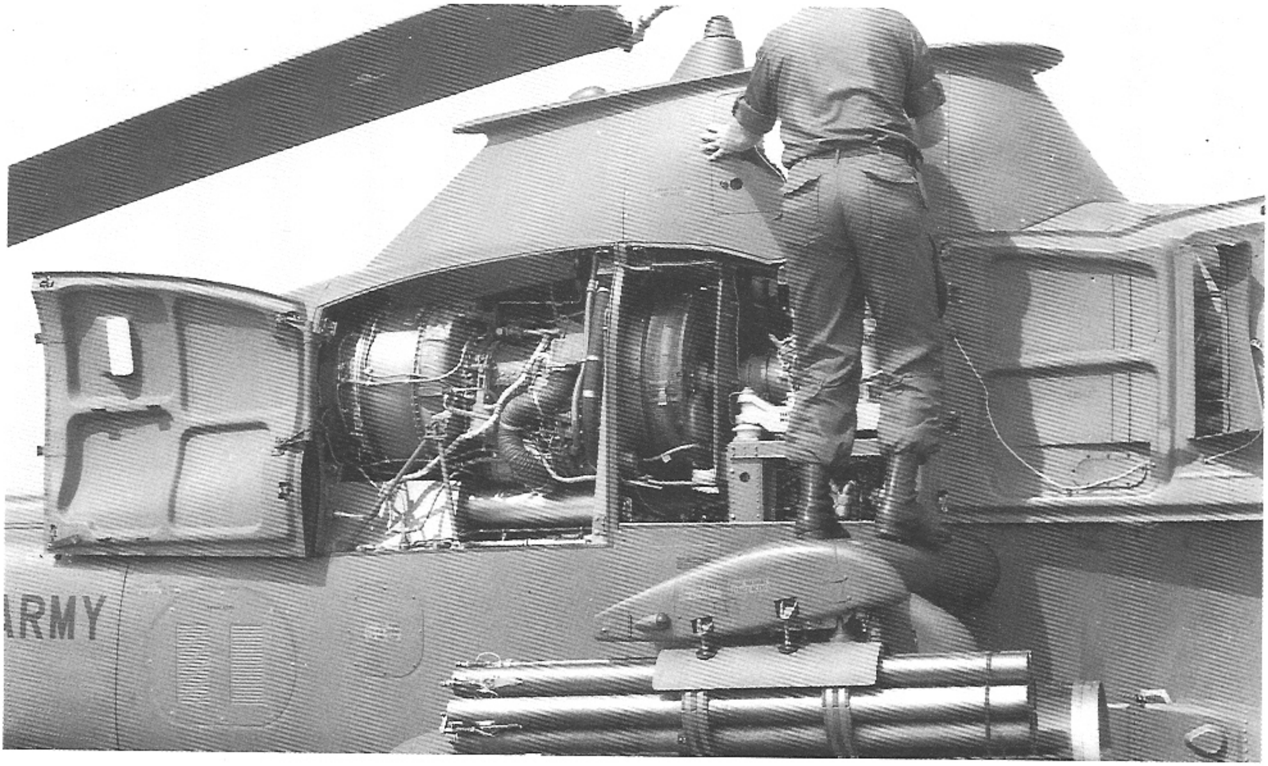
The Baseline Aircraft

THE SUBJECT of considerable modernisation and modification since it entered service with the US Army in the summer of 1967, today's HueyCobra is indeed a markedly different helicopter and one that possesses a significantly superior capability when compared with the original AH-1G. Most of the effort over the past decade has been directed primarily towards enhancing the type's initially quite modest potential in the anti-armour role, perhaps the most visible manifestation of this being the fitting of launchers and associated equipment for the Hughes BGM-71 TOW (Tube-launched, Optically-tracked, Wire-guided) missile which is now standard kit on front-line examples.

In its original AH-1G form, Bell's HueyCobra was relatively unsophisticated, this providing emphatic evidence of the "crash" nature of the programme, which was mainly concerned with developing and deploying, in fairly short order, a reasonably heavily armed machine for combat service in South-East Asia. The resulting helicopter was expected to be capable of escorting large, unarmed and generally vulnerable troop-carrying rotary-wing craft like the Boeing-Vertol CH-47 Chinook and of performing "reconnaissance by fire", in which armed helicopters "swept" areas either suspected of containing enemy troop concentrations or which had been selected to serve as landing zones (LZs) for use in setting down friendly ground forces.

Since it took little more than six months to move from the start of design to the helicopter's first flight, it follows that Bell elected to base the 'Cobra very firmly on the UH-1 Iroquois. As already noted, the degree of "commonality" with that type was high—which only goes to show just how deceptive appearances can be, for the resulting HueyCobra looked quite unlike the Iroquois at first glance, and today

Below: 2.75in rockets streak away from an early production AH-1G HueyCobra during a live-firing exercise conducted soon after the helicopter entered US Army service.



Above: Engine and transmission detail can be seen in this view of a standard AH-1G HueyCobra undergoing routine servicing, the stub wing acting as a convenient platform.

the apparent dissimilarity is, if anything, even more marked. Closer scrutiny, however, did reveal similarities, most notably with regard to the undercarriage and tail boom, although even here there were differences, the tail rotor, for instance, being mounted to starboard on the AH-1 instead of to port as was the case with the UH-1.

Beneath the skin, the story was rather different, key elements like the powerplant, transmission and rotor being "lifted" more or less directly from the UH-1C. Power for the HueyCobra was initially furnished by a single 1,044kW (1,400shp) Lycoming T53-L-13 turboshaft engine derated to 820kW (1,100shp) so as to maintain output in "hot and high" climatic conditions similar to those which prevailed in South-East Asia.

"Door hinge" rotor

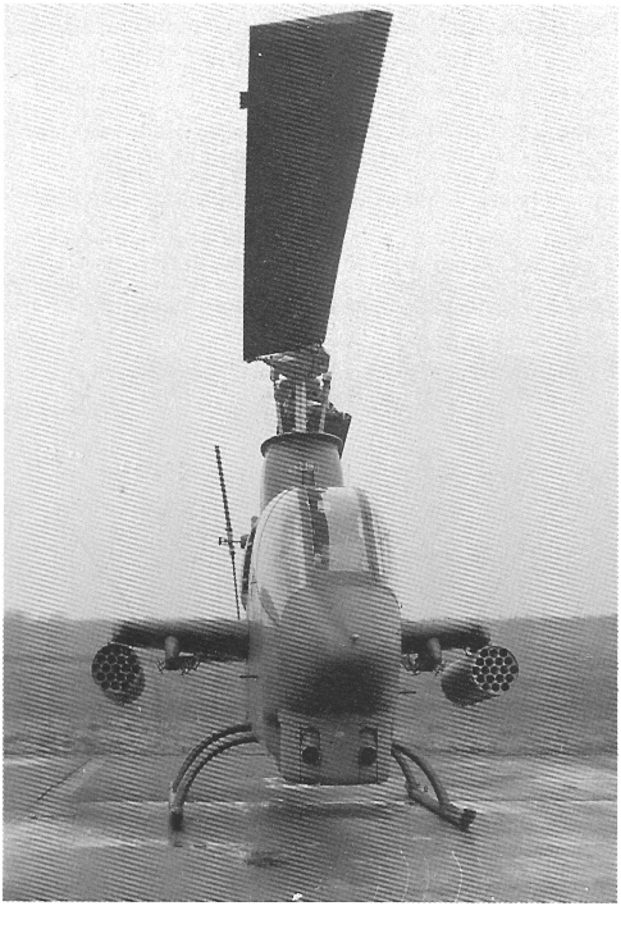
The main rotor was two-bladed, of the so-called "door hinge" type, and known to the parent company as the Model 540. Introduced on production examples of the Huey in the latter part of 1965, it was of wide chord and incorporated a braking device, although it did not fold for stowage. The fully interchangeable blades were built up of extruded aluminium spars and laminates and in normal operations rotated at between 294 and 324rpm. A two-bladed metal flex-beam rotor of honeycomb construction was fitted to the tail pylon, shaft drive being used by both this and the main rotor blade.

The small stub wings which protruded from the fuselage side beneath the main rotor head could also generate a modest amount of lift, in the process alleviating main rotor loadings during cruising flight whilst simultaneously providing a convenient place on which to hang extra armament, an aspect which will be examined in greater detail later. The wing span of the AH-1G, AH-1J and AH-1T variants is 10ft 7in (3.23m).

With regard to the fuselage, this did, of course, differ markedly, largely as a result of the fact that it was never intended to carry more than two occupants. Bell's experiments with the so-called Sioux Scout had revealed that the most desirable seating layout for an armed helicopter was in tandem, since this offered a number of worthwhile benefits. For example, it provided a vastly improved field of view for the gunner in the front cockpit, and since one of his main concerns was target acquisition, any help of this nature was warmly welcomed. At the same time, positioning the crew members in tandem enabled the fuselage width to be greatly reduced, from around 8ft (2.43m) on the UH-1 to barely 3ft (0.91m) on the HueyCobra. Needless to say, there were drawbacks, one being the weight penalty incurred as a result of the increased armour plating protection necessary for two crew members, but this was felt to be a worthwhile sacrifice and it is doubtful whether it had very much impact on overall performance or payload.

In turn, two main benefits resulted from the slimming process. First, the more slender fuselage caused far less drag, thus endowing the AH-1G with much greater cruising and maximum speeds than the UH-1 even though it employed an identical powerplant and was considerably heavier. Perhaps of greater importance to HueyCobra crew members was the fact that the slender frontal aspect presented a much smaller target when viewed from head-on. In terms of its construction, the HueyCobra's fuselage was much less revolutionary, embodying a conventional, all-metal, semi-monocoque structure throughout.

Below: The narrow frontal aspect and the wide chord of the main rotor blade are two of the HueyCobra's distinctive features. Here two 19-tube FFAR pods are carried underwing.



Fixed, tubular skids

The retractable undercarriage units tested on the prototype HueyCobra were abandoned, and it was decided to employ fixed, tubular skids on production aircraft for the sake of simplicity. However, it should be noted that small wheels could be fitted to permit movement in instances where it was neither feasible nor desirable to hover-taxi. These, not surprisingly, were removed before flight.

Apart from the repositioned tail rotor, the after fuselage section and vertical fin were basically similar to those of the UH-1. Mid-positioned elevators of inverted aerofoil section and with a modest amount of sweep-back were located on the tailboom sides a short distance forward of the fin, at the base of which was fitted a sharply raked tail skid.

Hydraulic pressure for the flight controls and other key services was provided by a 3,000psi (207-bar) system incorporating Abex pumps, the 28V DC electrical system being battery-powered. Environmental control and fire detection systems also featured in the baseline aircraft, while the relatively unsophisticated avionics package of the AH-1G included such gear as the AN/ARC-131 FM tactical radio, the AN/ARC-51AX UHF command set, the AN/ARC-134 voice communications set and the TSEC/KY-28 secure voice communications set.

Devastating armament

Not surprisingly, it was in terms of its armament that the initial HueyCobra variant was perhaps most noteworthy, for it was infinitely more capable than virtually anything which had gone before and it must have had a devastating impact on the Viet Cong guerrillas when it made its combat début in the autumn of 1967. Indeed, there is one particular story which provides graphic confirmation of just how feared the Cobra quickly became. It tells of an incident which took place soon after the first Marine Corps AH-1Gs reached Marine Observation Squadron Two (VMO-2) at Da Nang in April 1969. In a book entitled *Marines and Helicopters 1962–1973*, Col. Kenneth S. Foley recounted the tale:

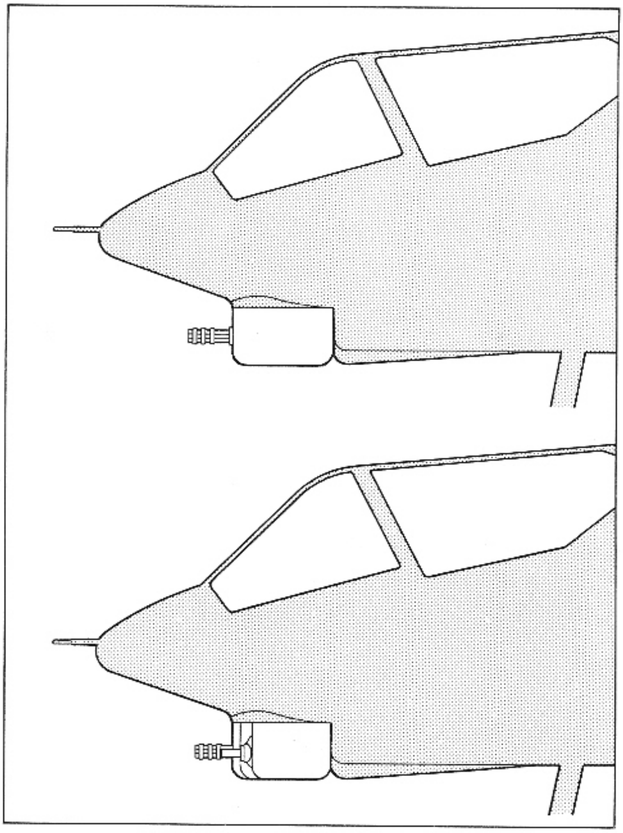
"With Cobras covering, a Marine rifle company was moving out cautiously. Shots came from around the bend and the Cobras covered the area with fire. When the Marines got there, five Viet Cong were horizontal; four dead and one wounded. The VC was shouting and banging his fists into the dust. One company commander asked the interpreter what all the shouting was about.

"'He's apparently the squad leader', the interpreter replied. 'He's yelling, "If I told them once, I told them a thousand times—don't shoot at that kind of helicopter!"'"

Undernose gun turret

Although all HueyCobras do feature an under-nose gun turret as standard equipment, a variety of weapons have been carried here, Bell, the US Army and the US Marine Corps taking advantage of technical developments to incorporate different "fits" at different times. In general, gun firepower has been steadily improved as the AH-1 has matured.

Initial production examples of the AH-1G were fitted with Emerson Electric's TAT-102A undernose tactical armament turret, which contained a single GAU-2B/A (formerly XM-134) 7.62mm six-barrelled Minigun with no fewer than 8,000 rounds of ammunition and capable of an impressive rate of



Above: At the time it entered service, the AH-1G was fitted with Emerson Electric's TAT-102A turret containing a single 7.62mm Minigun (top). Subsequent development led to the more flexible M28 sub-system (above), which permitted various combinations of GAU-2B/A Miniguns and M129 grenade launchers to be used.

Below: Displaying the badge of the 71st Aviation Company on the side of the transmission housing, AH-1G HueyCobra 70-16003 was one of a large number stationed in Europe with the US Army. Armament capability is typical of the pre-TOW era.

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fire. However, this package soon gave way to the M28 armament sub-system, which was considerably more flexible in that it was compatible with either Miniguns or grenade launchers.

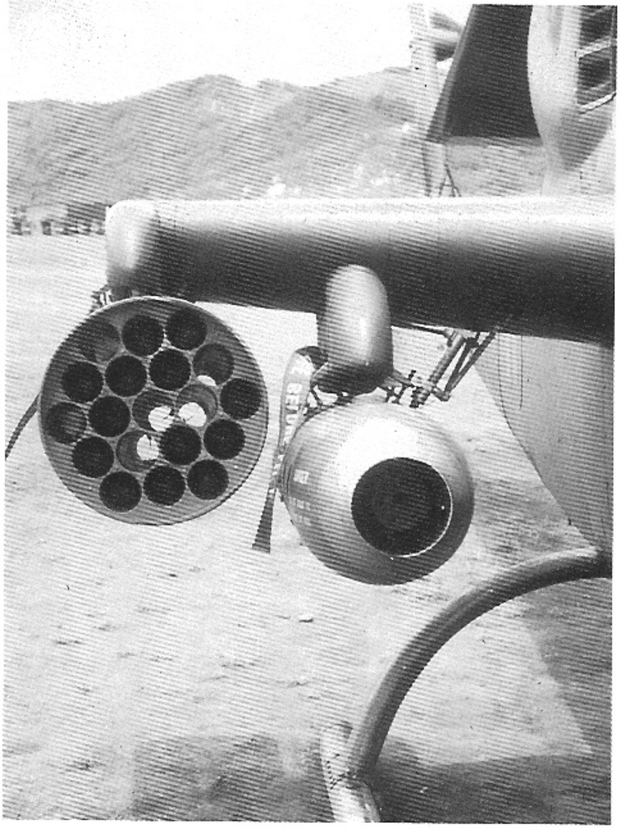
Various M28 configurations were available, the turret being able to mount a pair of standard Miniguns, or two M129 40mm grenade launchers, or one Minigun and one grenade launcher. The ammunition capacity was 4,000 rounds per Minigun and 300 per launcher. Firing rates varied considerably, the Minigun possessing the ability to use a slower, 1,600rds/min rate for search and registry, thereafter switching to 4,000rds/min for attack although, obviously, the latter could not be sustained for more than a few moments at a time. M129 grenade launchers were more sedate but could still achieve a respectable 400rds/minute, more than enough to spoil anyone's day if accurately placed.

High damage expectancy

Further work on improving the weapons capability resulted in the Bell/General Electric M35 armament sub-system, which in essence consisted of a single, six-barrelled M61 20mm automatic cannon, two ammunition boxes each containing 500 rounds, and associated structural and electrical modifications. Tipping the scales at around 1,172lb (531kg), this weapon system had only a modest firing rate—750rds/min—but this was more than offset by the higher levels of damage expectancy arising from the use of heavier ammunition with greater penetration, accuracy and range.

First evaluated by the US Army on half a dozen specially modified AH-1Gs that were delivered during December 1969, the M35 was mounted on the inboard hardpoint beneath the port stub wing with the ammunition containers faired flush to the fuselage side directly below. Trials with the system culminated in a favourable report, and the Army subsequently invested in 350 M35 kits.

Other armament could be carried on the stub wings, each of which featured two hardpoints. In the event of additional gun capability being required, a single M18E1 7.62mm Minigun pod could be fitted on the inboard station on each side of the Cobra; alternatively, up to four launcher pods could be carried, to give a maximum capacity of 76 2.75in rockets. Two basic types of pod were available, each example of the M159 containing 19 rockets and the M157 holding only seven. Smoke grenades and chaff dispensers also formed part of the outfit.



Above: The armament carried on the four hardpoints located beneath the AH-1G's stub wings varied. The example depicted here is fitted with an M159 19-tube rocket pack and an M18E1 7.62mm Minigun, a six-barrelled weapon capable of an impressive rate of fire.

Weapons management

The responsibility for managing the various weapons systems was fairly evenly divided between the two crew members. In the normal course of events, the co-pilot/gunner was responsible for the turret-mounted gun, while the pilot looked after the wing-mounted ordnance. However, a degree of interchangeability was built in, making it possible for each crew member to utilise systems for which the other was normally responsible.

The gunner utilised a hand-held, pantograph-mounted sight to engage his target, the turret being slaved to this device and capable of operating through a field of fire which extended 115 degrees to both left and right of the AH-1G centreline, as

Above: Apparently lacking any kind of unit identification markings, an AH-1G returns to Vung Tau in South Vietnam at the end of a training flight in April 1969.

well as 50 degrees in depression and 25 degrees in elevation. Lead angle computations were accomplished automatically and took into account the relative motion of both the helicopter and its target. The firing rate was controlled by the gunner's trigger.

Should the need arise, the pilot could also fire the turret-housed weapons, although an inhibiting system limited his use of these to situations in which the weapons were in the stowed position, pointing dead ahead. Thus, in the event of the gunner sustaining injury or being incapacitated for some reason, all he had to do was release his hold on the slewing switch: once this was done, the turret automatically returned to the stowed position, permitting the pilot to use it.

The pylon-mounted weapons were usually controlled by the pilot, who had an M73 adjustable reflex rocket sighting unit. To avoid problems arising from asymmetry, rockets were invariably fired in pairs made up of one from each opposing wing station. Once again, a measure of redundancy was built into the AH-1G, permitting the gunner to fire wing-mounted ordnance. Finally, in the event of an emergency, all the wing stores could be jettisoned, either symmetrically or *in toto*.

Since the HueyCobra was expected to go "trouble-shooting" in the normal course of duty, it was rather more durable than the utility Iroquois, both crew members being given added protection by the installation of seats and side panels embodying the Norton Company's NOROC armour plate. Other vital and vulnerable areas, such as the transmission unit, were also surrounded by this tough material. However, the requirement for this added protection and the provision of various items of armament and armament-related equipment inevitably increased the helicopter's gross weight; as a result, although its dimensions were fractionally smaller, it was considerably heavier than the UH-1C Iroquois from which it evolved, the empty weight of the UH-1C being about 4,750lb (2,155kg) compared to the AH-1G's fairly hefty 6,073lb (2,745kg).

Production under way

Once the first firm order had been placed for the AH-1G model, little time was wasted in getting the manufacturing process under way, production-configured examples beginning to roll from the Fort Worth assembly line during the course of 1967. As noted elsewhere, the initial contract apparently covered 112 helicopters and was placed with FY66 funding.

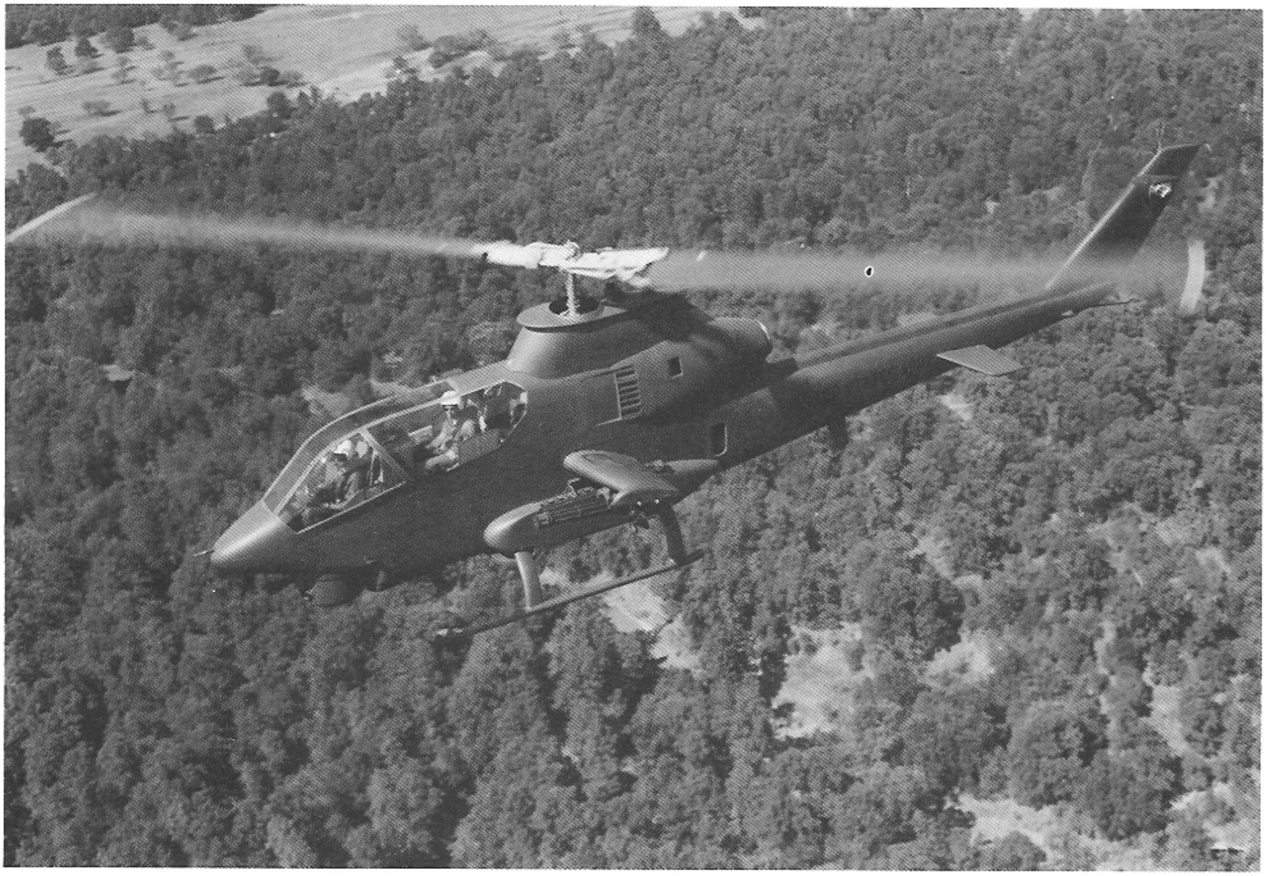
For what was originally viewed merely as an interim buy prior to the more sophisticated and theoretically more capable AH-56 Cheyenne, the HueyCobra did not fare at all badly during the next couple of years, the FY67 appropriation covering no fewer than 420 AH-1Gs. A further 308 examples followed in FY68, presumably as a mid-term solution to the apparently increasing need for dedicated helicopter gunships, although the fact that the future of the much-vaunted AH-56 was by this time beginning to look far less rosy may well have been an influential factor in the large 1968 order.

FY69 procurement was much more modest, being limited to just 38 aircraft obtained as replacements for an identical number of Army machines diverted to the US Marine Corps during the course of that year. In FY70, however, the number purchased rose again, 170 examples being contracted for by the US Army and Spain also buying four for service with its naval air arm. A repeat order from Spain for an identical number followed in FY71, the year in which US Army procurement of the AH-1G terminated with a final batch of 70.

Unfortunately, there seems to be a certain amount of confusion concerning the number of AH-1Gs actually produced. Certainly, there is some doubt as to the eventual disposition of the original civil-registered prototype N209J, for it is understood that this could well have been taken over by the US Army and given the military identity 64-7015, thereafter serving as one of the two AH-1G prototypes.

Similar confusion surrounds the size of the first production batch for the US Army, many authoritative sources stating that this actually numbered 110. However, since 112 serial numbers were allocated (66-15246 to 66-15357), it would appear that there were definitely 112. Finally, there is the vexed question of those aircraft supplied to Israel, and here the author is inclined to the opinion that these were former US Army machines which became redundant after the US withdrawal from Vietnam. Thus, if N209J did become 64-7015, if the initial Army batch did number 112 (as seems most likely), and if the Israeli AH-1Gs were indeed redundant US Army specimens, production must have totalled 1,128, this figure being broken down into one original prototype which later adopted military markings (N209J/64-7015), one genuine Army prototype (64-7016), 1,118 production examples for the US Army (38 of which were diverted to the Marines), and eight production examples for Spain.

Below: Incorporating a six-barrelled M61 20mm cannon, the M35 armament sub-system was fitted beneath the port stub wing and provided a quite devastating increase in firepower.



3

Cobras for the Marines

ALTHOUGH IT WAS the US Army which provided the initial impetus for the HueyCobra programme, another element of the US armed forces soon began to express a desire to obtain a similar type of helicopter: the US Marine Corps was also heavily committed to combat in South-East Asia, where its principal gunship was the suitably modified UH-1E Iroquois.

The Marine Corps' interest in the HueyCobra began to develop at a very early stage, and a total of 38 AH-1Gs were diverted to the service during the course of 1969, some of these being despatched to Vietnam where they soon began to establish an impressive combat record. However, fine helicopter though it may have been, the AH-1G had a number of failings as far as the Marines were concerned, not the least of which was the fact that it was single-engined.

Much of the Marine mission is predicated upon amphibious operations, and it follows automatically that USMC helicopters will spend much of their time flying over water. It is hardly surprising, therefore, that the service was not exactly over-enthusiastic about the fact that the HueyCobra was single-engined, and those responsible for procurement pushed hard for the additional safety margins offered by a twin-engined design.

Another aspect which caused some misgivings was the lack of a rotor brake, it being felt by the Marines that the provision of this device was essential when they were operating under pressure from the often cramped confines of amphibious support ships. Similarly, there were some who felt that the AH-1G's 7.62mm gun was less than ideal, and they argued long and hard for the adoption of a 20mm cannon, a weapon that offered much greater "clout" even though the maximum firing rate was considerably lower.

The Marines succeeded in getting the helicopter they asked for, but not without a struggle, for it was originally intended that the AH-1J be powered by the same engine as the AH-1G, initial procurement planning anticipating the acquisition of 38 SeaCobras with FY69 funding. Ironically, it was the so-called "Tet Offensive" of spring 1968 which proved influential in helping the Marines to get their way, several examples of the single-engined UH-1E being knocked out in the heavy fighting that occurred before the situation stabilised.

Funds are diverted

Since replacements were clearly needed and since a suitable engine was not available, the Marines continued to press their claims for a twin-engined SeaCobra, and their persistence was eventually rewarded when Secretary of Defense Robert S. McNamara requested Congress to divert funding from less urgent projects to the Marine Corps gunship. Approval was duly forthcoming, the benefits being two-fold in that the service's powerplant requirement was satisfied while the quantity of helicopters involved also increased quite significantly, rising from 38 to 49.

However, further controversy continued to dog the fortunes of the AH-1J model. This time, the problem was the decision to utilise a non-US engine, United Aircraft of Canada's (later Pratt & Whitney Canada) T400-CP-400. House Armed Services Committee chairman L. Mendel Rivers was prompted to write to McNamara in early April 1968 and express his concern, and the Secretary of Defense was left with little alternative but to direct a competitive evaluation prior to engine selection for the AH-1J—which of course meant further delay. In the event, on 3 July, the Naval Air Systems Command requested proposals from all eligible engine manufacturers, including those in Canada, setting a one-month deadline for submissions.

The response was, to put it mildly, unenthusiastic,

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Above: The first Cobras to see service with the Marines were obtained from the Army in 1969 when a total of 38 AH-1Gs were transferred. Some later saw combat in Vietnam.

only two engine manufacturers bothering to reply. One of these was United Aircraft of Canada, the selection of whose engine caused the difficulty in the first place. The only other candidate was the Continental Aviation and Engineering Corporation of the USA.

A study of these two submissions indicated that both were evidently suitable, but the Canadian offering did have a big advantage in that not only had it been exhaustively tested but it was also in quantity production; Continental Aviation's engine, on the other hand, would not become available for some time and, in view of that, it was obviously impossible to guarantee that it would be satisfactory. It was no surprise that the Canadian contender emerged victorious, about the only other positive outcome of this episode being yet further delay.

Successful maiden flight

In the meantime, the contract award for the initial production batch of 49 AH-1Js had taken place on 29 May, and the first example (BuNo 157757) was duly rolled out at Bell's Fort Worth factory on 14 October 1969, making a successful maiden flight the following month.

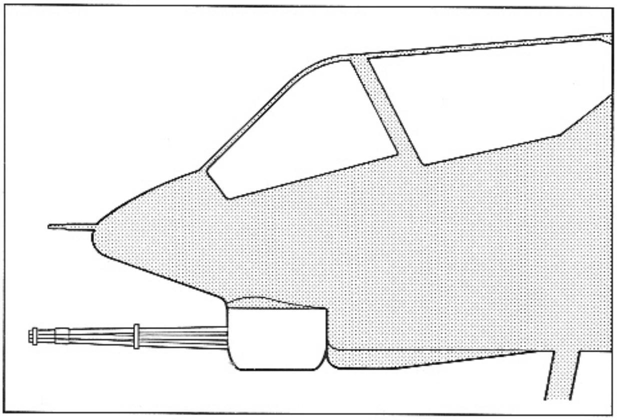
Unlike the AH-1G, which had been assimilated into the Marine Corps' inventory with the minimum of fuss, the AH-1J required extensive testing by both the parent company and the service itself, a highlight of this programme coming in the summer of 1970 when four SeaCobras took part in Board of Inspection and Survey (BIS) trials with the Naval Air Test Center at Patuxent River, Maryland. One of the key hurdles in the process of bringing any new type to operational service with either the Navy or the Marine Corps, completion of BIS testing cleared the way for deliveries to begin, and VMO-1 at New River received the first of seven AH-1Js, which it was to employ in crew and maintenance training tasks, in September of that year.

Even as that work got under way, plans were being laid to introduce the SeaCobra to combat in Vietnam, four AH-1Js being shipped to the war zone aboard Military Airlift Command Douglas C-133 Cargomasters in mid-February 1971. Following reassembly, the four helicopters were turned over to HML-367, which staged the first combat sortie from its base at Marble Mountain on 22 February. This was the start of an intensive evaluation which lasted slightly over two months and entailed an impressive tally of 614 hours' flight time. The evaluation was no less impressive in terms of ordnance expended—14,950 rounds of 7.62mm ammunition, 72,945 rounds of 20mm ammunition and 2,842 rockets—and it was hardly surprising that the subsequent report to the Commanding General remarked that "the combat evaluation determined that the AH-1J provides a significantly greater effectiveness in fire-power over the AH-1G".

"Activation cadre"

While the AH-1J was beginning its combat evaluation in distant South-East Asia, steps which would culminate in the formal establishment of the first USMC Helicopter Attack Squadron (HMA) were being taken at New River, North Carolina, when an "activation cadre" was created. This actually began operations with a number of UH-1Es, and had to wait a couple of months before it began to acquire the SeaCobra, the first four to be assigned to the unit reaching New River in company with the Marine Corps' first UH-1N on 7 April 1971. Thereafter, the flow of brand-new AH-1Js began to increase, and by the end of June a further 23 examples had been turned over to the "activation cadre". On 1 July, the cadre was disbanded, its aircraft and personnel being used to form the initial complement of HMA-269, the first of three such units to be activated for service with the regular forces of the Marine Corps.

In basic terms, the missions assigned to Marine SeaCobras differed little from those of their Army equivalents. The helicopters were specifically tasked with the delivery of weapons fire, search and target acquisition, reconnaissance by fire, multiple weapons fire-support, and troop-carrying helicopter support. There was one big difference, however, relating to operating bases. The AH-1J was expected to be equally at home on prepared and unprepared areas as well as aboard ships at sea or in close proximity to land. What resulted was a helicopter that, although it bore an obvious family likeness to the AH-1G, was very different, as the following should make apparent.



Below: AH-1J SeaCobras differed markedly from AH-1Gs with regard to gun armament, the M197 system featuring a long-barrelled 20mm Gatling-type rotary cannon—a derivative of the ubiquitous M61—with 750 rounds of ammunition fed from a drum mounted in the fuselage.

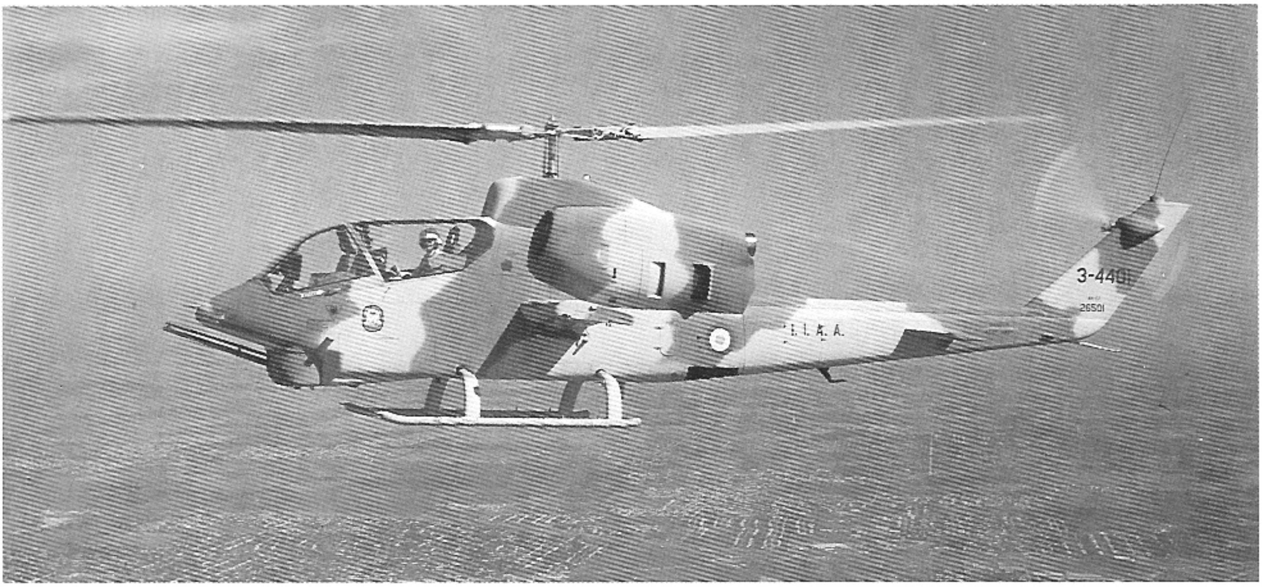
The principal difference related to the powerplant, USMC Cobras being fitted with the 1,342kW (1,800shp) Pratt & Whitney Canada T400-CP-400 coupled, free-turbine, turboshaft engine, which was essentially a militarised version of the highly successful commercial PT6T-3 Turbo Twin Pac. Offering twin-engine safety, it was flat-rated to 820kW (1,100shp) continuous power, with an increased rating of 932kW (1,250shp) available for take-off or in case of emergency, although it should be noted that the latter was subject to restriction, it being undesirable to run at this rating for more than five minutes.

The rotor system and drive were almost identical to those of the AH-1G, about the only key difference being the provision of a rotor brake which made operations at sea much safer. The diameter of the tail rotor remained unchanged, but its chord was slightly increased, and push/pull rotor controls were also adopted by the AH-1J.

Revised gun system

With regard to weaponry, the AH-1J did differ markedly in that the integral gun system was changed in favour of an electrically operated General Electric turret containing an M197 three-barrelled 20mm cannon, the long barrel of this gun system being one of the more readily apparent recognition features; indeed, its 5ft (1.52m) length dictated that the gun be stowed in the dead ahead position before ordnance carried on the stub wings could be employed.

Essentially a lightweight model of the widely used M61 cannon, the M197 came complete with 750 rounds of ammunition housed in a fuselage-mounted drum, and was nominally capable of achieving a firing rate of 750 rounds per minute.



Above: By far the most important single customer for the AH-1J SeaCobra was Iran, no fewer than 202 examples being procured for service with the Army. The first of these machines is seen here during the course of an early test flight. It is doubtful whether many now remain airworthy.

However, an inhibition system incorporated into the firing circuitry confined individual bursts to a maximum of 16 shells, so as to avoid problems such as jamming which could result from the weapon overheating. The firing envelope was 110 degrees to both left and right of centreline, 18 degrees upwards and 50 degrees downwards, marginally less in azimuth and elevation than the corresponding figures for the Army's AH-1G.

In terms of external ordnance, the AH-1J employed a fit similar to that of the HueyCobra, being able to operate with a maximum of four LAU-61 or LAU-68 pods holding seven and 19 2.75in rockets respectively. Alternatively, SUU-11A Minigun pods could be fitted to the inboard stations or smoke grenade dispensers to the outboard stations, and the total external payload was around 2,200lb (998kg).

Unlike the AH-1G, however, it appears that the division of crew functions was not quite so tightly defined, both crew stations possessing flight control and fire control systems. It also appears that three primary armament configurations were envisaged, for which combat radius and mission time varied quite dramatically. In "basic" rig, with gun and a pair of LAU-68 seven-tube rocket pods, combat radius was 134 nautical miles and mission duration 1.87 hours, excluding time before start of *en route* climb and reserves. In "medium" rig, with gun, two LAU-68 pods and two SUU-11A Minigun pods, these figures fell to 72nm and 1.08hrs. Finally, there was "heavy" rig, with gun and a quartet of LAU-61A 19-tube rocket pods: this configuration had a startling effect on range and duration, which plummeted to just 7nm and 0.19hrs, the increased weapons payload only being achieved at the cost of fuel.

Another area of considerable change involved mission-related avionics, the AH-1J being fitted out with a package of Navy-compatible equipment which included an AN/ARC-51AX UHF command set, an AN/ARC-131 FM tactical set, an AN/AIC-18 intercom, an AN/ARN-52(V) Tactical Air Navigation (TACAN) system, an AN/ARA-50 UHF DF, an AN/ASN-75 gyrosyn compass, an AN/ARN-83 DF set, an AN/APN-171(V) radar altimeter, an AN/APX-72 identification friend or foe (IFF) transponder set and an AN/APN-154(V) radar beacon. Provision was also made for Juliet 28 two-voice security units, a TS-1843/APX transponder test set and a KIT-1A/TSEC Mk XII computer.

AH-IJs for Iran

The delivery of the initial batch of 49 SeaCobras was completed during the course of 1972, a repeat order for 20 more examples being placed by the Marine Corps in 1973. By far the biggest customer for the AH-1J, however, was Iran, which, in the early 1970s, embarked upon a major reorganisation of its Army.

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Above: The first prototype AH-1T Improved SeaCobra was in fact a remanufactured AH-1J. Following modification, it made a successful maiden flight on 20 May 1976. The revised design emphasised improvements in both performance and weapons-carrying capability.

As one of the world's major helicopter manufacturers, Bell naturally competed for the massive orders in prospect, and the company was rewarded with contracts covering the supply of 287 Bell 214As and no fewer than 202 TOW-compatible AH-1Js, delivery of the latter getting under way in 1974. However, following the overthrow of the Shah and the curtailment of US support, the flow of spare parts probably dried up and it is doubtful whether more than a couple of dozen AH-1Js remain operational with Iran's Army at the present time.

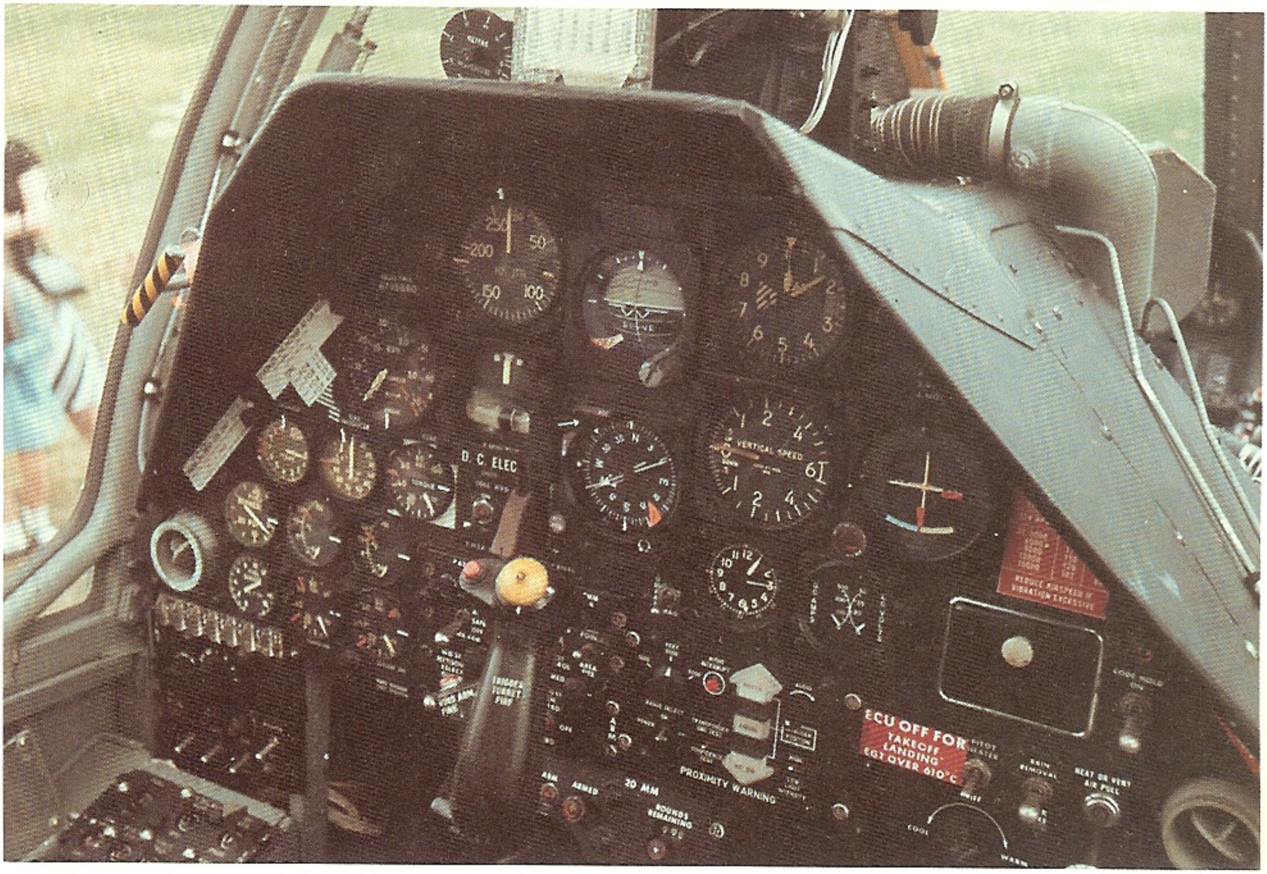
Improved variants

The Marine Corps has continued to put its faith in Bell's attack helicopter, new and improved variants having been developed and delivered in the decade or so that has elapsed since the last AH-1J was handed over in February 1975. The first to appear was the AH-1T Improved SeaCobra, which evolved out of the desire to increase payload and performance—objectives which were achieved in quite handsome style.

Work on the AH-1T began in the early 1970s, the final two AH-1Js being selected to serve as prototypes; the first of these, BuNo 159228, made its maiden flight, after modification, on 20 May 1976. Testing this and the second prototype proceeded more or less according to plan, and production machines duly began to reach Marine units about two years later, an initial batch of ten aircraft having been ordered in June 1975. Subsequent contracts raised the number of AH-1Ts procured for service with operational echelons to 55, most of which were eventually modified to TOW configuration.

Inheriting many features of the AH-1J, the Improved SeaCobra embodied many aspects of the Bell 214, these including the dynamic system, the main rotor head assembly and the tail rotor, power being furnished by Pratt & Whitney Canada's T400-WV-402 engine which has a maximum output of 1,469kW (1,970shp). Married to a revised transmission unit capable of delivering the full rated power, this engine has bestowed significant performance advantages on the helicopter, whilst the decision to "stretch" the AH-1T fuselage by 3ft 7in (1.1m) has permitted fuel capacity to be increased by about 14 per cent. Inevitably, operating weight has also risen, but the performance—particularly in the area of useful load (fuel and ordnance), which is more than double that of the AH-1J—fully compensates for this.

As for weaponry, the AH-1T's integral gun remains unchanged, as, indeed, do the number of stores stations available on the stub wings. However, capability has increased substantially, partly by virtue of a retrofit programme which has provided compatibility with the TOW anti-tank missile and which will eventually enable the AH-1T to utilise the Rockwell AGM-114A Hellfire "fire and forget" weapon that is now being deployed on Army AH-64A Apaches. Other ordnance which can be used by the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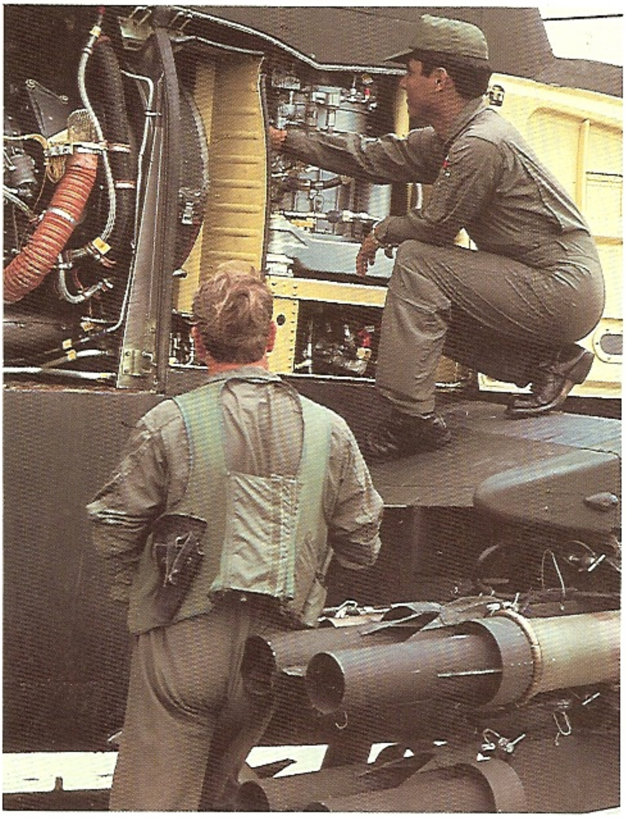
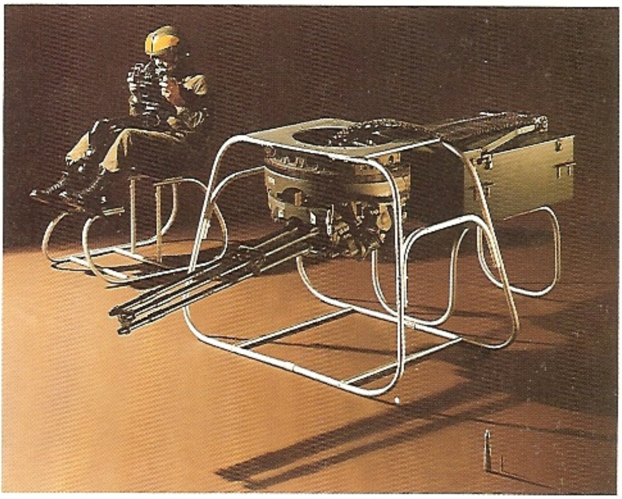
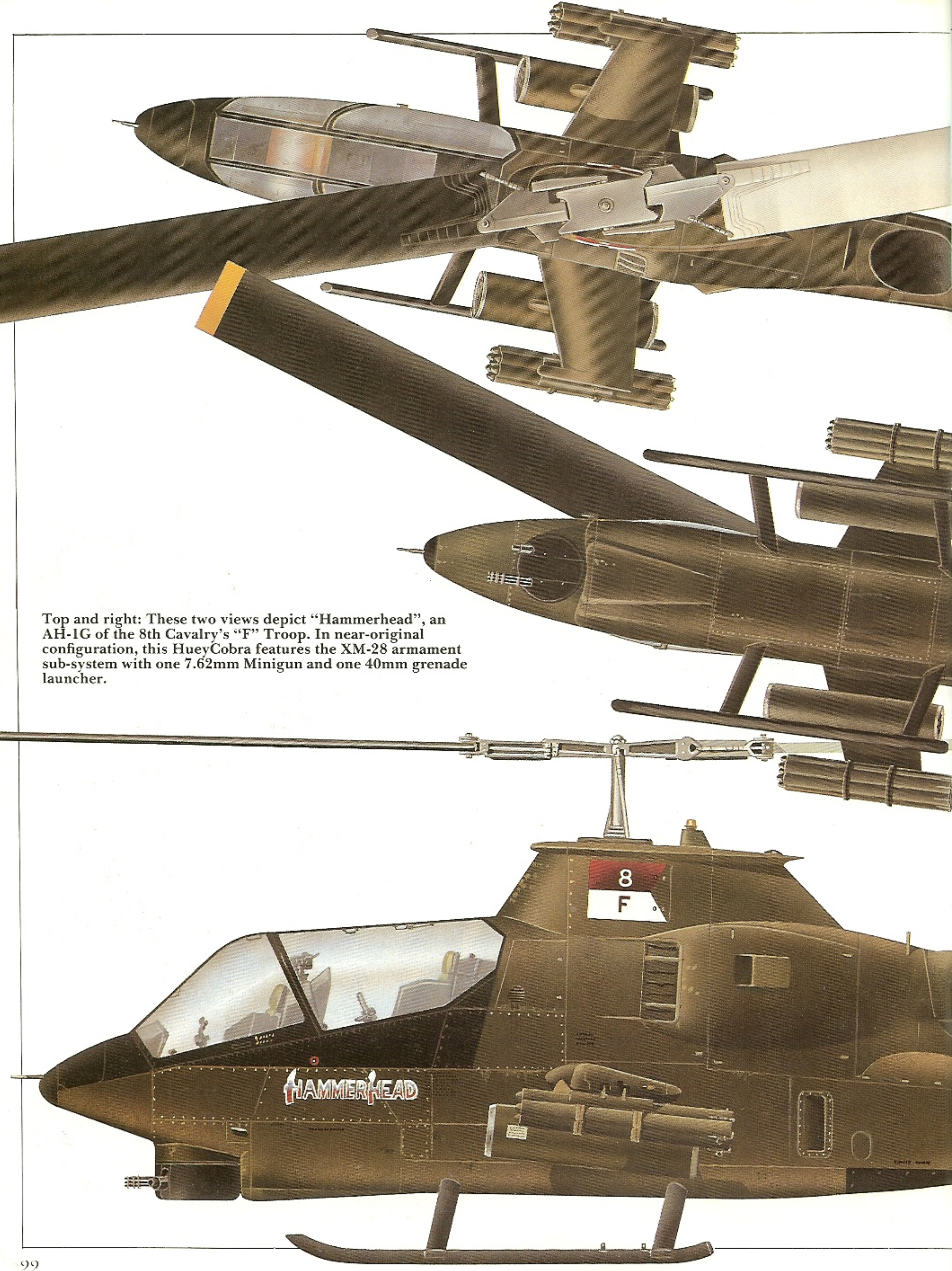


Above: The HueyCobra's rear cockpit contains a rather more comprehensive array of instrumentation than the front, and is invariably occupied by the pilot. Altimeter, air speed indicator, compass and artificial horizon are grouped together in the upper centre of the main panel.

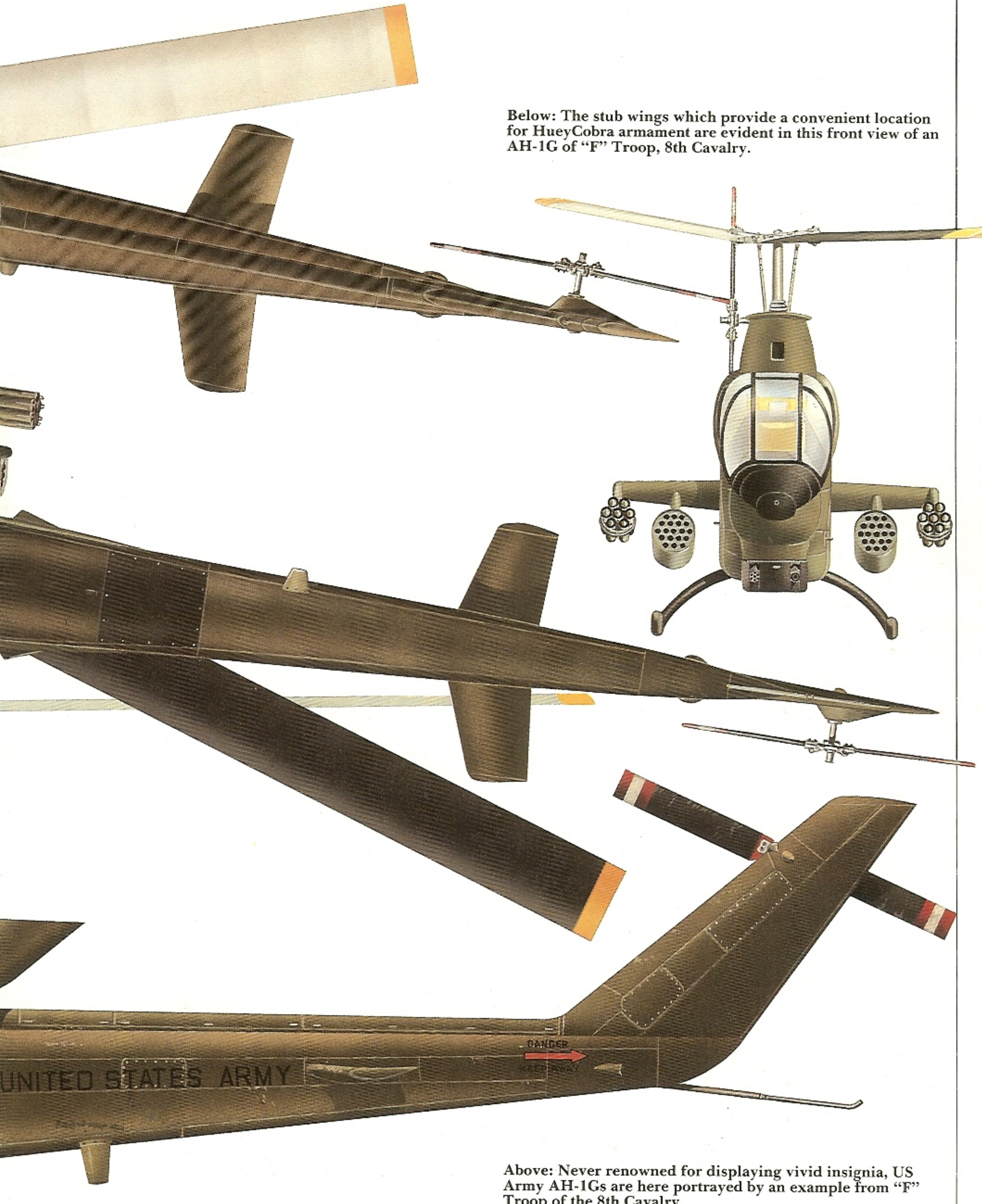
Left: An Army technician performs routine maintenance on the gearbox of an AH-1S while the pilot looks on. Launch tubes for the Hughes TOW missile are fitted to this Cobra.

Below: General Electric's recently developed universal turret system is indeed a bulky piece of kit, the example shown here incorporating a 20mm M197 rotary cannon.





Top and right: These two views depict "Hammerhead", an AH-1G of the 8th Cavalry's "F" Troop. In near-original configuration, this HueyCobra features the XM-28 armament sub-system with one 7.62mm Minigun and one 40mm grenade launcher.


UNITED STATES ARMY
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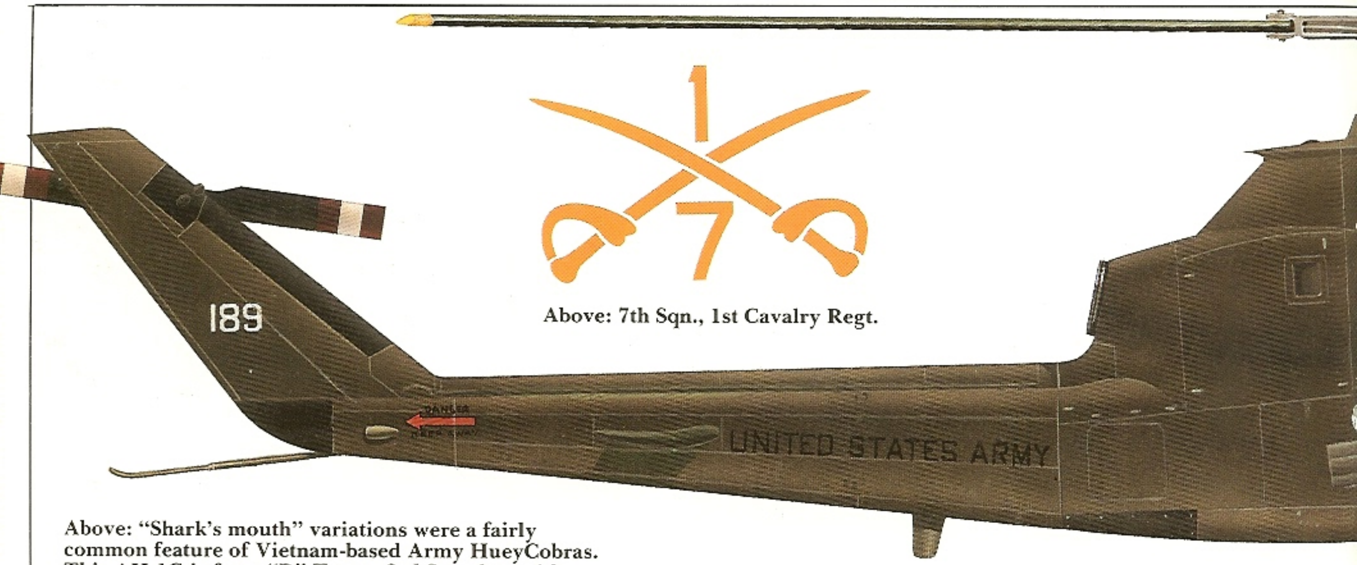
KEEP AWAY

Below: The stub wings which provide a convenient location for HueyCobra armament are evident in this front view of an AH-1G of "F" Troop, 8th Cavalry.

Above: Never renowned for displaying vivid insignia, US Army AH-1Gs are here portrayed by an example from "F" Troop of the 8th Cavalry.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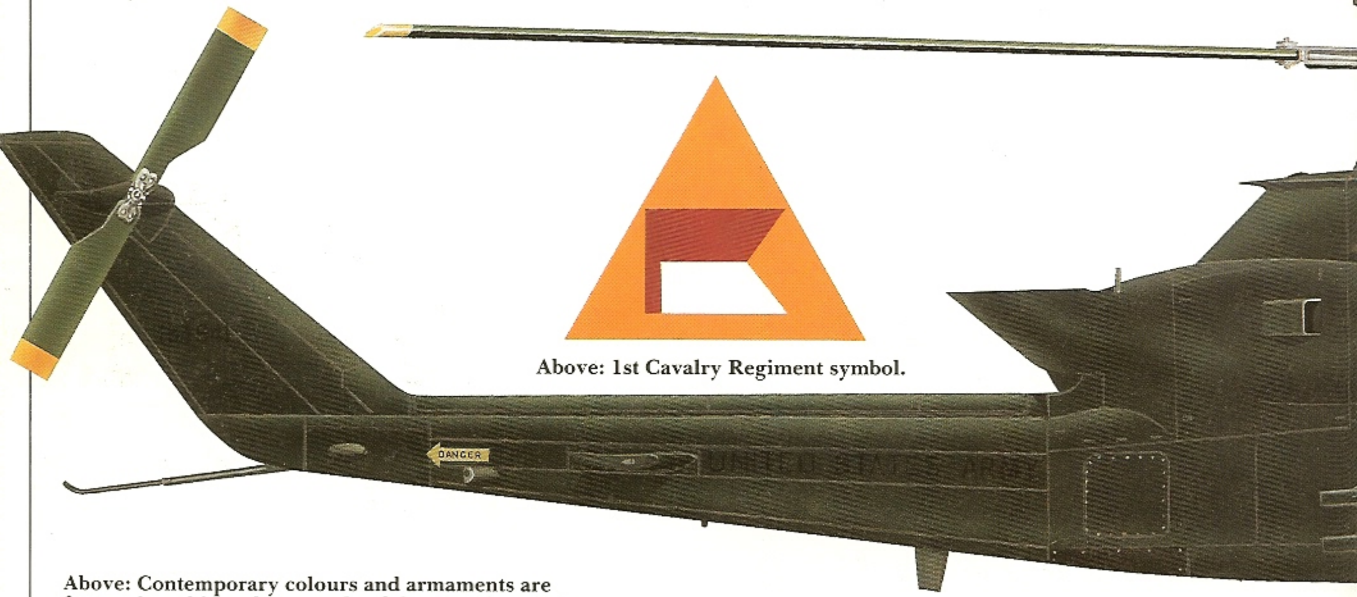
Above: 7th Sqn., 1st Cavalry Regt.

Above: “Shark's mouth” variations were a fairly common feature of Vietnam-based Army HueyCobras. This AH-1G is from “D” Troop, 3rd Squadron, 4th Cavalry.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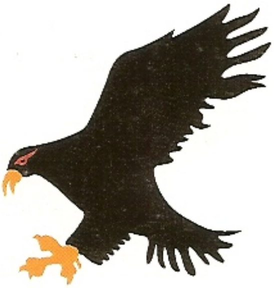
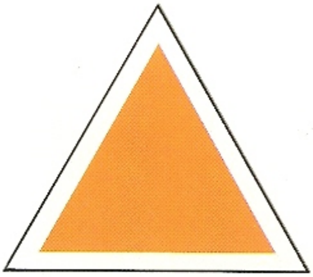
Above: 1st Cavalry Regiment symbol.

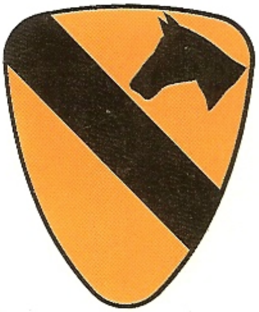
Above: Contemporary colours and armaments are featured on this early example of the AH-1S variant from “B” Company of the 3rd Battery during 1979.



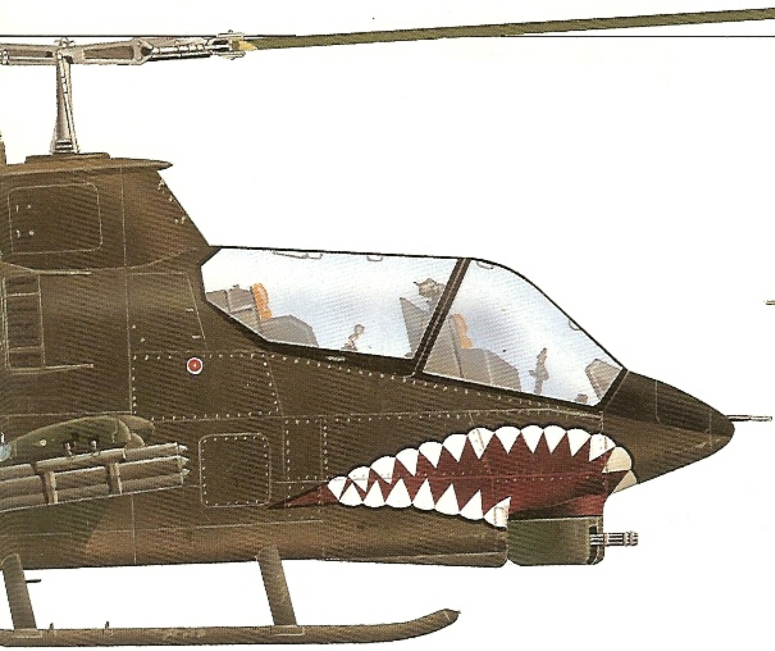
123rd Aviation Battalion.

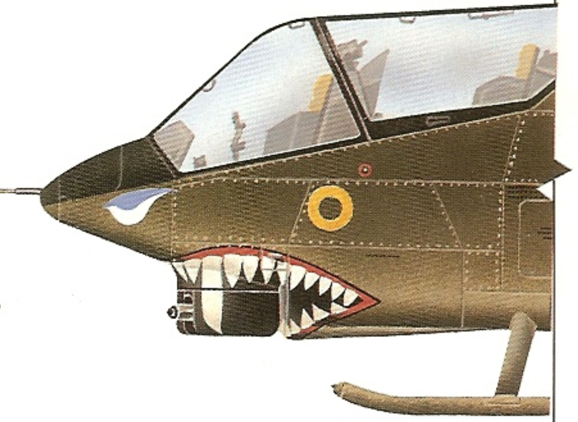


235th Aerial Weapons Company.

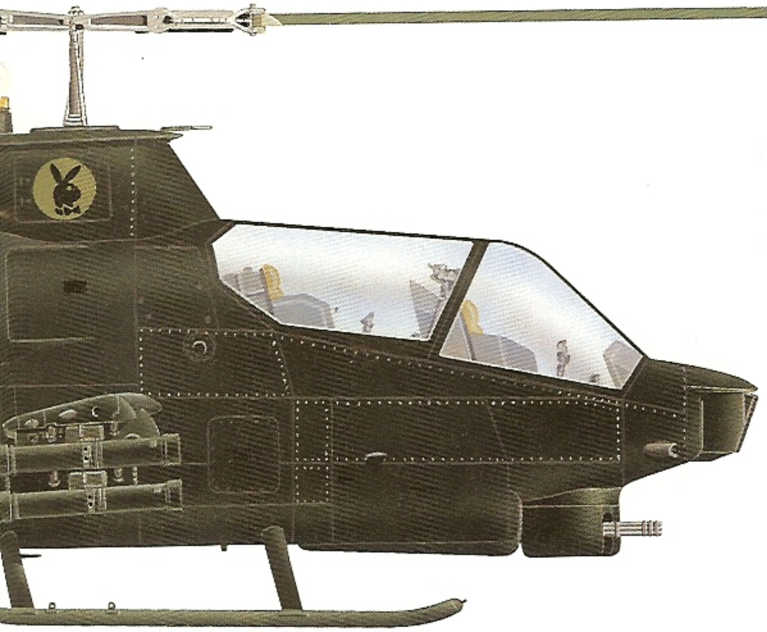


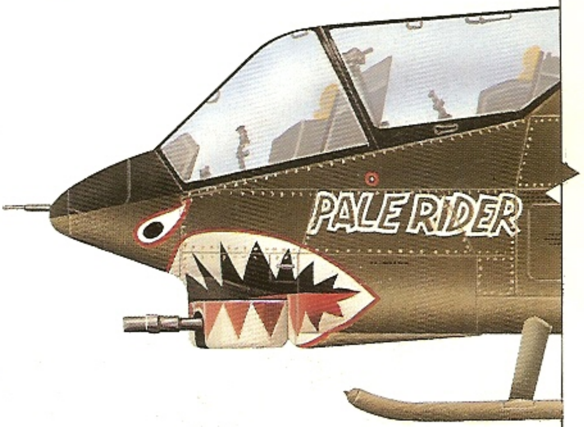
1st Cavalry Division (Airmobile).





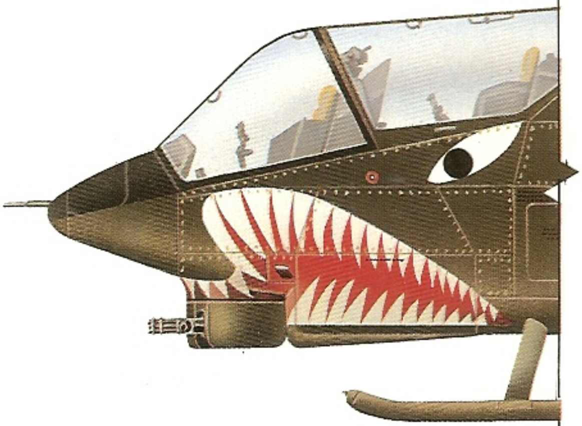
Above: Nose detail of an AH-1G of "C" Troop of the 1st Squadron, 9th Cavalry.

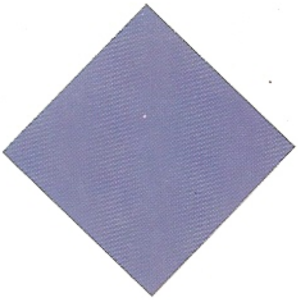




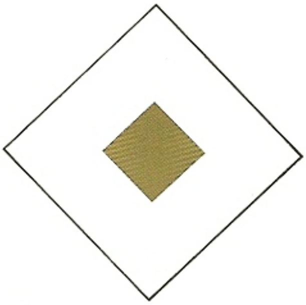
Above: "Pale Rider" was an AH-1G which served with the 1st Cavalry in Vietnam.

Below: This vicious "shark's mouth" was worn by Cobras of "B" Company, 25th Aviation Battalion.

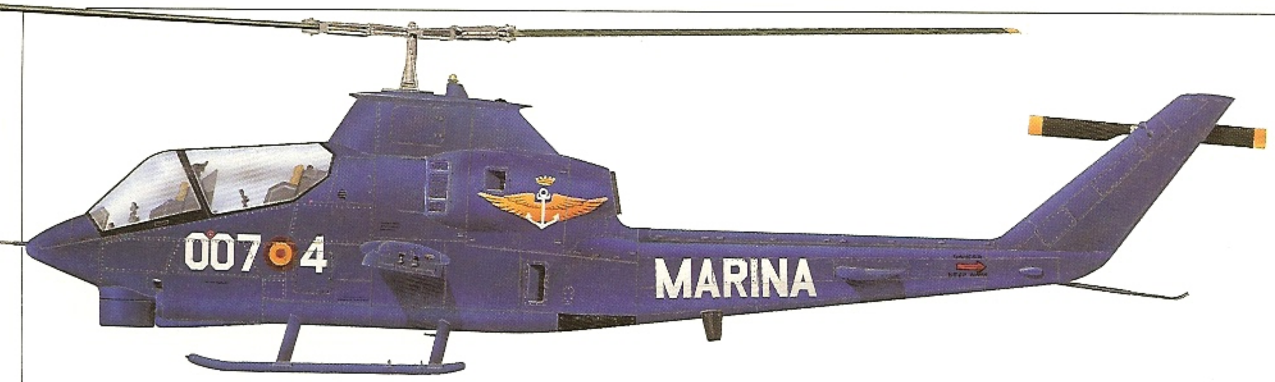




"A" Coy, 101st Airborne Division.



334th Assault Helicopter Coy.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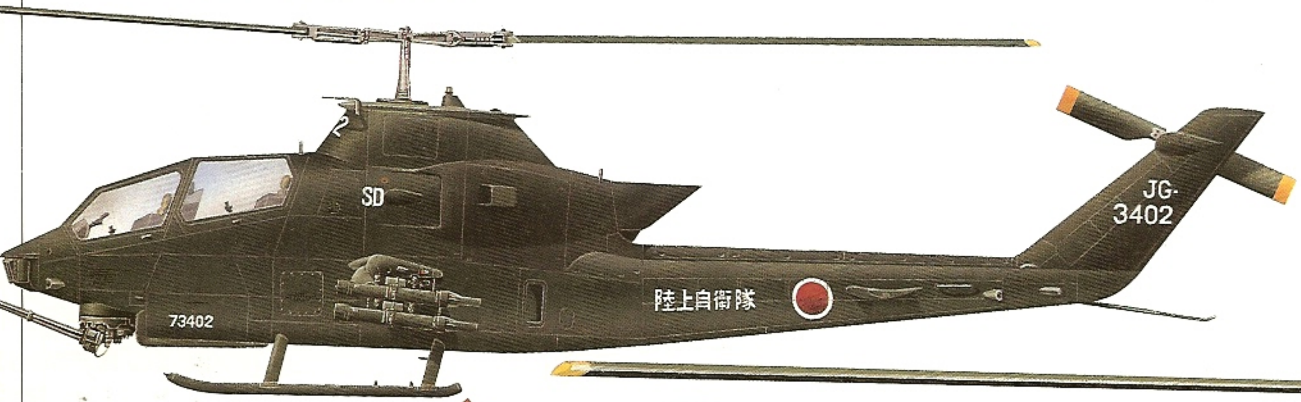
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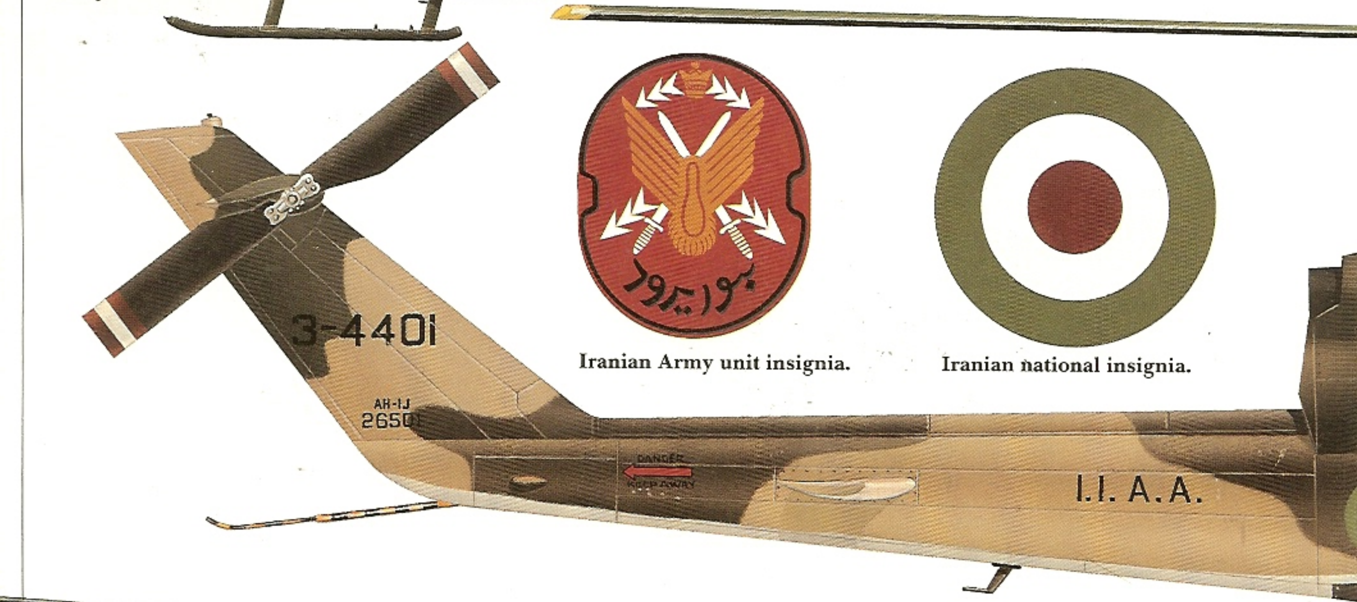
هوانیروز
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AH-1J
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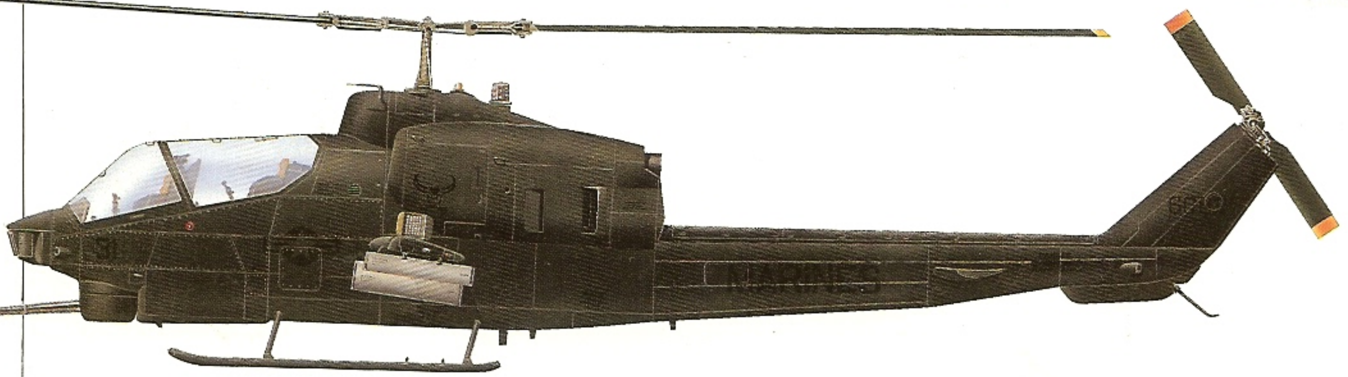
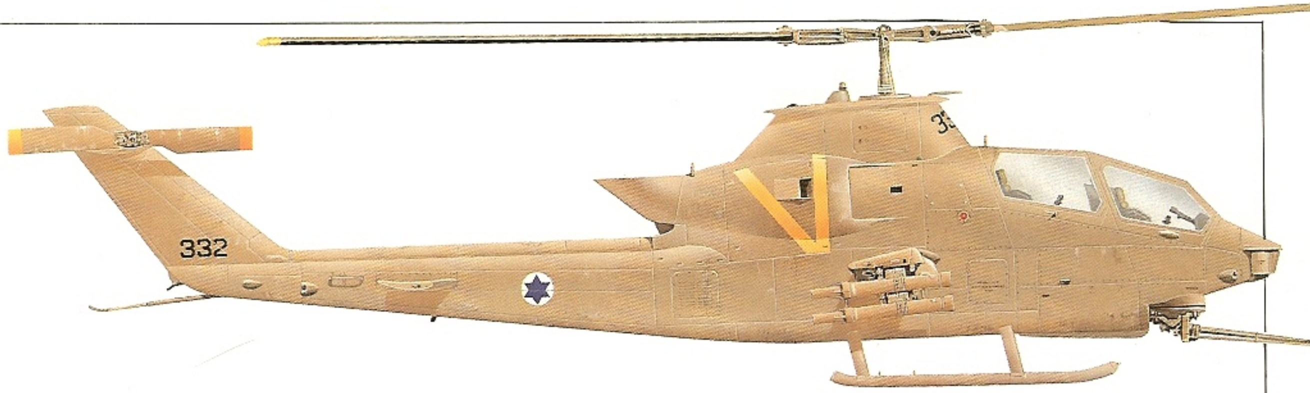
DANGER
KEEP AWAY
I. I. A. A.

Iranian Army unit insignia.

Iranian national insignia.

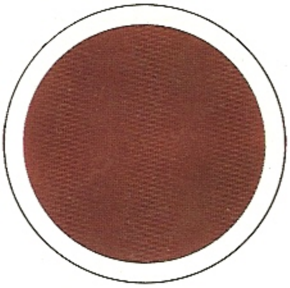




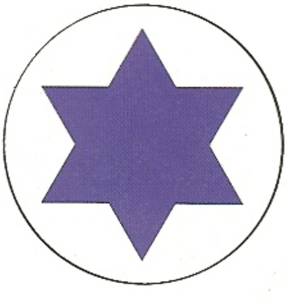
Above left: One of the few export customers for the AH-1G was the Spanish Naval Air Service. All eight HueyCobras operated with Escuadrilla 007 from the main base at Rota.

Above: To a recent production standard, this AH-1S is one of a number of HueyCobras known to have seen service with Israel's Defence Force/Air Force in desert camouflage.

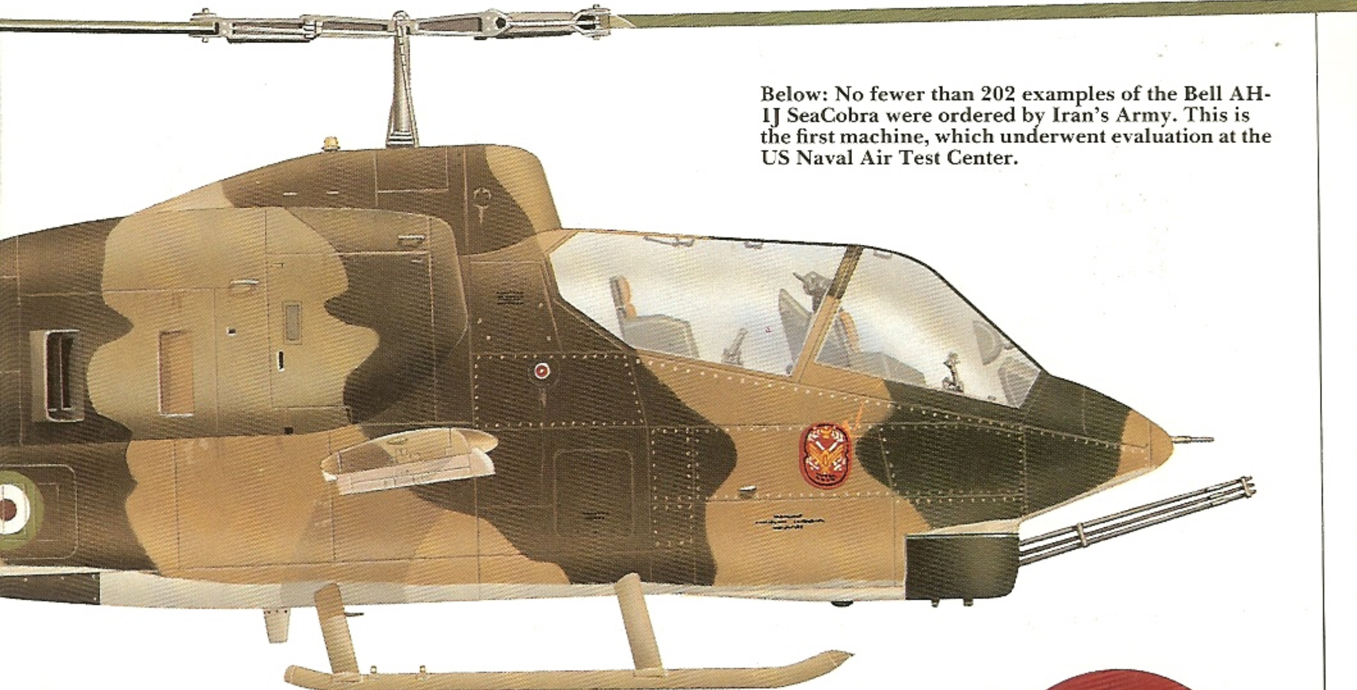
Left: Assigned to the Air Training Support Squadron at Akeno, AH-1S 73402 was one of two US-built pattern aircraft supplied to Japan's Ground Self-Defence Force in 1979–80.



Japanese national insignia.

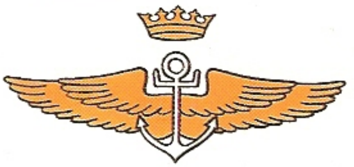


Israeli national insignia.

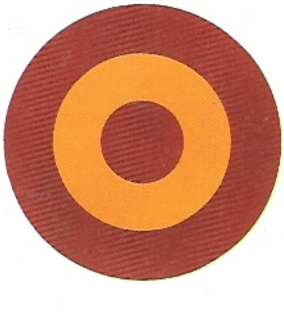


Below: No fewer than 202 examples of the Bell AH-1J SeaCobra were ordered by Iran's Army. This is the first machine, which underwent evaluation at the US Naval Air Test Center.

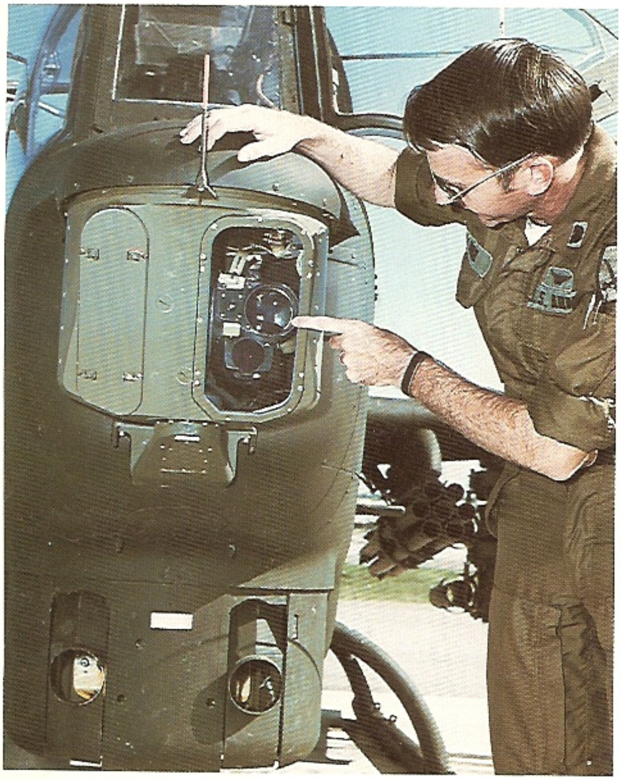
Left: Marine Corps Composite Helicopter Squadron HMM-261 utilised some AH-1Ts for close air support duties during the US invasion of Grenada in 1983. The specimen shown here with rocket launch tubes was typical of the handful of SeaCobras that were involved in this brief military exercise.

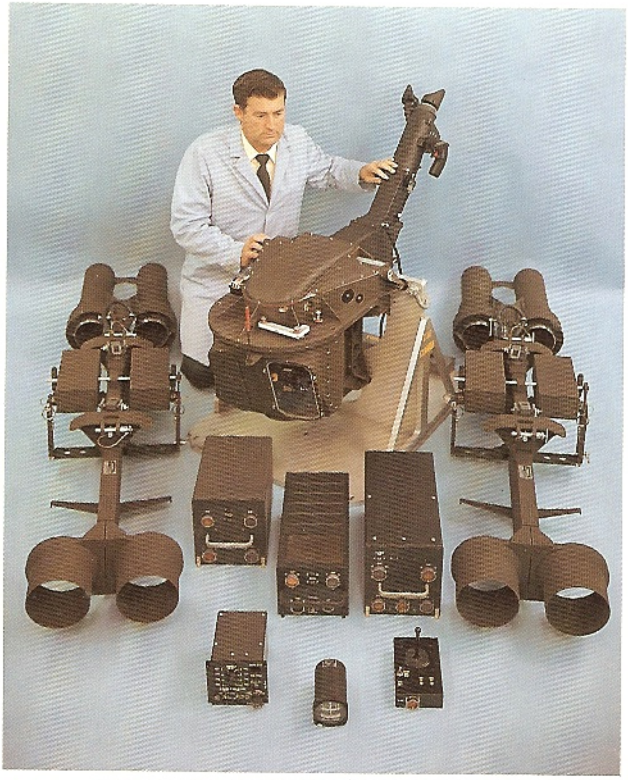


Above: Spanish Naval Air Service.



Right: Spanish national mark.

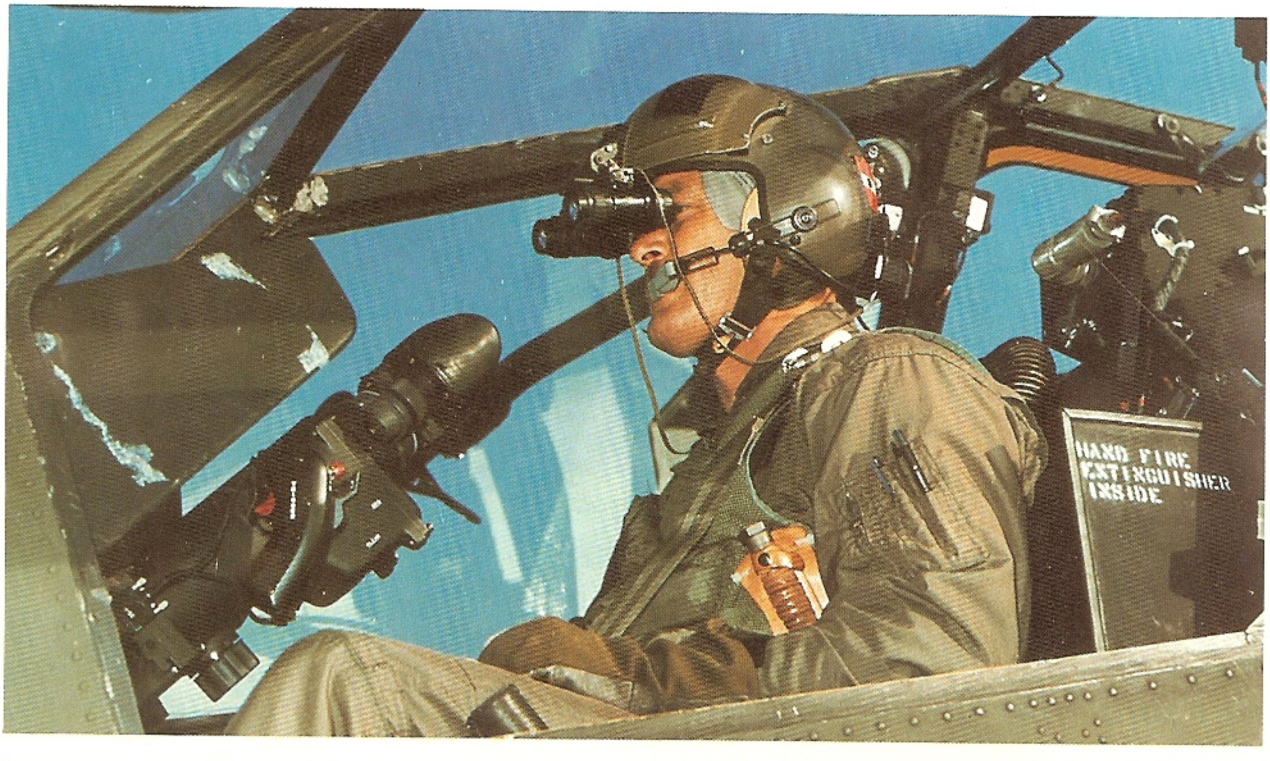




Above left: The telescopic sighting device which permits gunners to detect and track targets may be easily seen in this close up view of the nose of an Army AH-1S HueyCobra.

Above right: The entire TOW missile system is displayed to advantage in this company publicity picture. Electronic sub-assemblies are contained in the three large black boxes while the two smaller boxes are aircrew control systems.

Below: Night/all-weather anti-tank capability is enhanced by the use of a variety of optical aids, such as the night vision goggles being worn by this HueyCobra gunner.



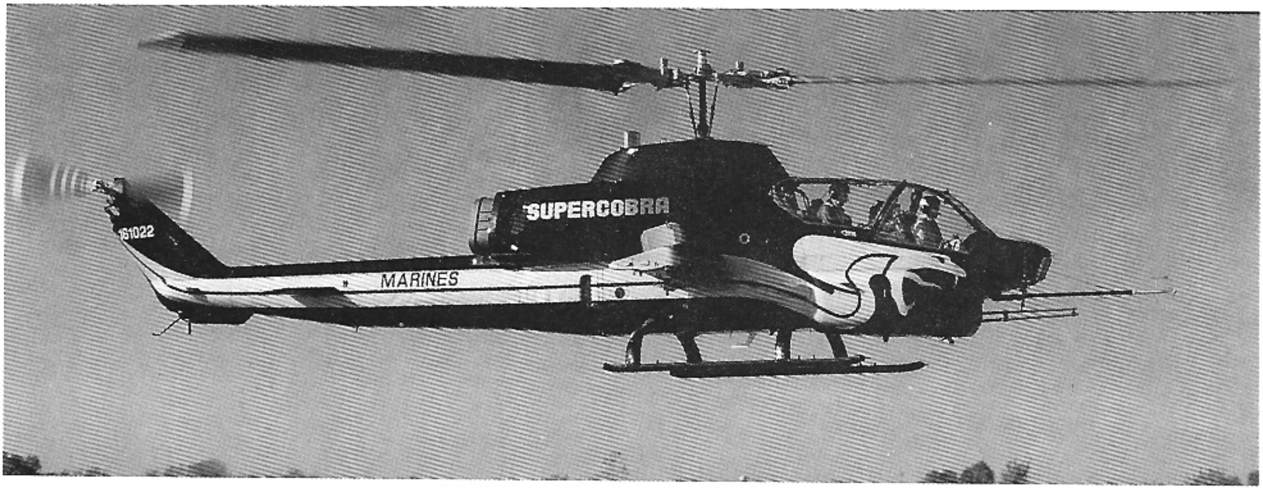
AH-1T includes the familiar LAU family of 2.75in rocket pods, M118 grenade launchers, CBU-55B fuel-air explosives, SUU-44 flare dispensers, Minigun pods and Mk 45 parachute flares.

Updating initiatives have not stopped here: projects aimed at enhancing the capability of both the AH-1J and the AH-1T are in the process of implementation at the present time. With regard to the AH-1J model, the 50 or so surviving examples will also be made compatible with Hellfire, and most AH-1Ts are to be upgraded to AH-1T/700 standard in a programme which will involve the installation of the General Electric T700-GE-401 powerplant as well as providing a more crashworthy fuel system.

Above: Two newly manufactured AH-1T SeaCobras fly in close formation near Bell's production facility. TOW launchers and 20mm cannon make up the armament.

Perhaps the most ambitious development of recent times is the so-called AH-1T+ SuperCobra, work on this derivative getting under way in 1980 when Bell successfully flew an AH-1T fitted with two General Electric T700-GE-700 turboshaft engines offering a combined power output of more than 2,386kW (3,200shp). Intended mainly to permit key criteria for any future enhanced-capability gunship

Below: Probably the ultimate development of the HueyCobra family, the AH-1T+ is now in the process of entering service with Marine Corps attack helicopter squadrons.



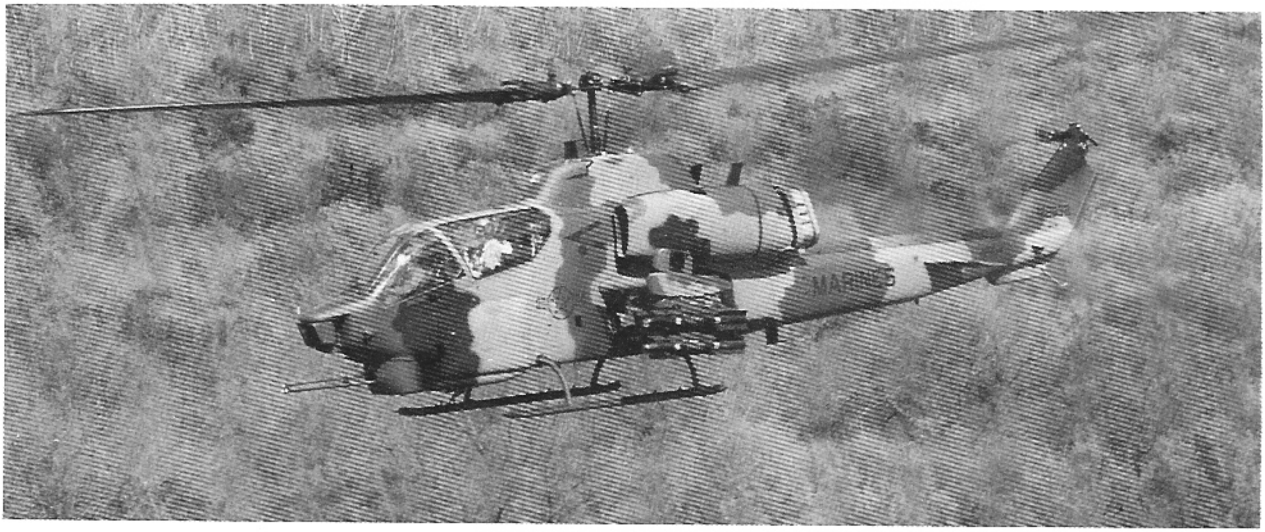
Above: Featuring a particularly ferocious-looking snake motif on the fuselage side, the prototype SuperCobra first took to the air on 16 November 1983

to be established, this eventually evolved into what is now known as the AH-1W, GE's T700-GE-401 engine being selected for this new model.

With a total output of 2,423kW (3,250shp), an AH-1T (BuNo 161022) flew in modified form for the first time on 16 November 1983, evaluation of this prototype by the US Marine Corps getting under way in December the same year and being followed early in the New Year by Congressional approval for the purchase of an initial batch of 22 aircraft. Delivery of these began in early 1986, one of the first examples going to the Navy's Operational Test and Evaluation Force squadron, VX-5, at China Lake for an extensive series of trials.

Once again, performance gains are noteworthy, the maximum cruising speed having increased by some 25kt (29mph, or 46km/h), to about 160kt (184mph, or 296km/h) at 3,000ft (915m). The offensive capability is also further enhanced, the AH-1T+ being compatible with the AIM-9L Sidewinder heat-seeking air-to-air missile. Ultimately, the Marines intend to purchase a total of 44 AH-1T+ Super-Cobras, following the initial FY85 buy of 22, with an identical number in FY86. At the same time, the modernisation of the older AH-1Ts will bring them up to AH-1T+ configuration as far as the power-plant is concerned, and it seems reasonable to assume that weapon upgrading will also form part of this programme.

Below: In total contrast to the prototype, production examples of the AH-1T+ are beginning to appear in a particularly distinctive camouflage finish, based on the use of dark green, black and a lighter blue-grey hue. Low-visibility national insignia are applied beneath the cockpit.



4

More Variants for the Army

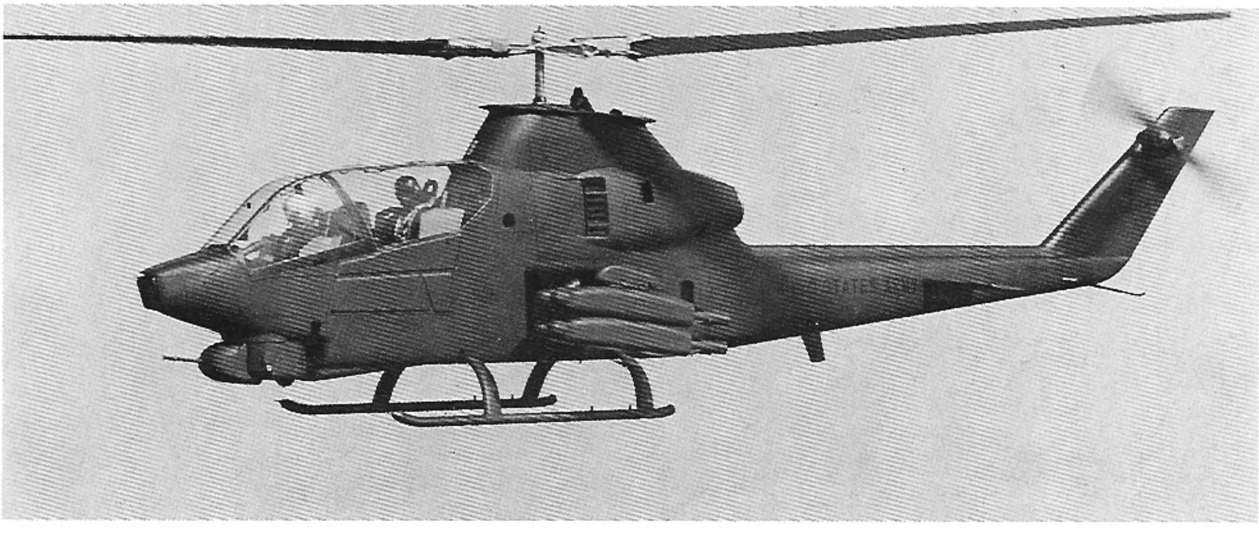
EVEN AS THE Marine Corps was taking the first steps towards acquiring the considerably more capable AH-1T, so also was the Army entering a period of modernisation with respect to its own large fleet of HueyCobras. As with the Marines, this process has proved to be a fairly lengthy one, further updating initiatives implemented in the late 1970s and early 1980s bringing about a fair degree of proliferation in HueyCobra variants.

One of the first new sub-types to appear was the TH-1G dual-control trainer, an unspecified number of standard AH-1Gs having been modified to this standard and assigned to training units located at key Army aviation centres in the continental USA. Modifying the AH-1G also led to the AH-1Q, AH-1R and AH-1S models, the last now being the principal Army "gunship" version of the HueyCobra and the subject of a quite substantial new-build programme which, coupled with remanufacturing efforts involving just over 400 aircraft, has raised the number on hand to several hundred, these serving with both front-line combat echelons and second-line Army National Guard units.

The United States having succeeded in extricating itself from the Vietnam nightmare, the Army emerged with a huge fleet of armed helicopters and began to set about updating European-based combat elements, which had been somewhat neglected while the service's attentions were firmly focused on more pressing engagements in the Far East. Studies of the type of conventional conflict likely to be fought in Europe quickly revealed that, in its original form as the AH-1G, the HueyCobra was unlikely to be of much value, largely because of its poor anti-armour capability.

Heavily armed the helicopter may have been, but the existing gun, grenade and rocket weaponry would prove virtually ineffective in the European theatre, where armoured fighting vehicles such as tanks and personnel carriers would almost certainly be encountered in considerable numbers. Clearly, some kind of increased capability was urgently required if the AH-1 were to play an effective part in

Below: Featuring what appears to be an experimental weapons fit, this particular HueyCobra was probably employed by Bell to evaluate some of the options that were available when serious consideration was being given to enhancing the type's already impressive firepower.



the conduct of any battle, and it was this need which led directly to the HueyCobra's transformation, early attempts at updating being concerned principally with providing a far more powerful "punch".

Genuine anti-armour capability

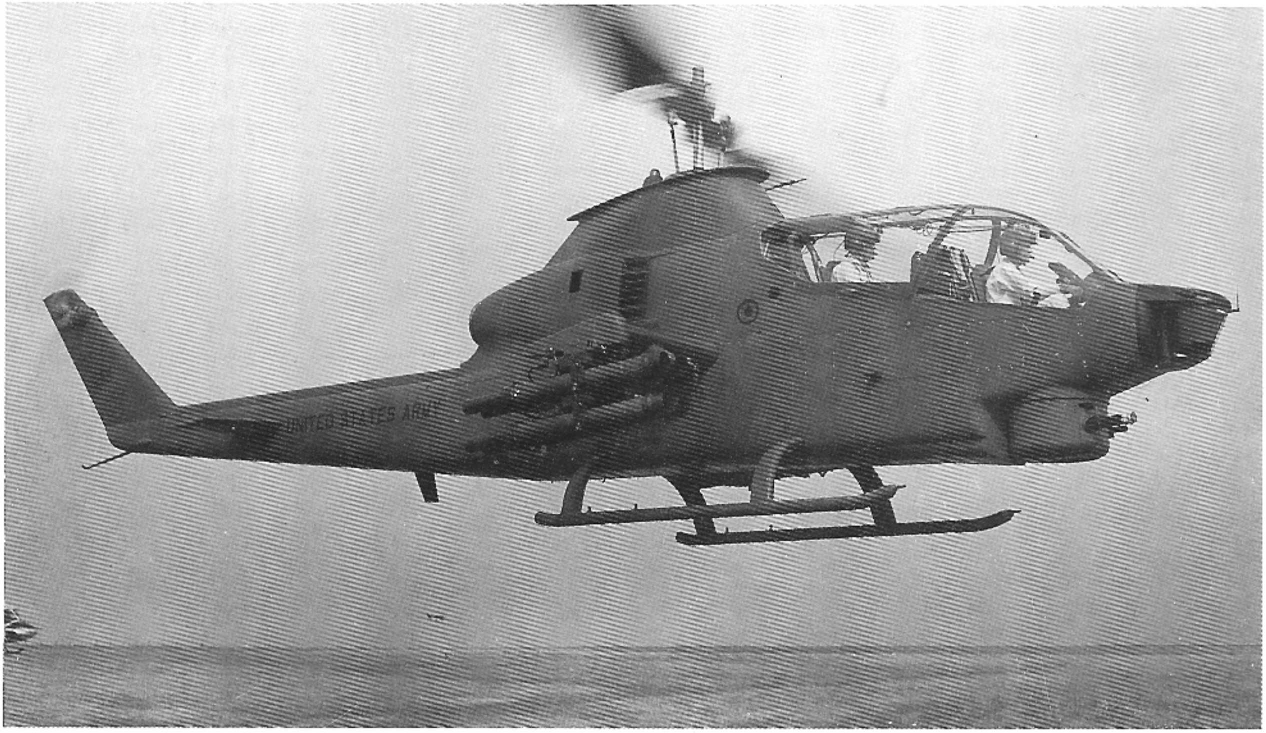
The first new model was the AH-1Q. This was essentially viewed as an interim solution to the problem, and the number of helicopters involved was modest by Army standards, only 92 AH-1Gs being converted to this configuration. Nevertheless, they did possess a genuine anti-armour capability, the Hughes BGM-71 TOW missile being added as standard kit.

Each AH-1Q could carry eight of these weapons, mounted on the outboard stores stations, in two 2-round clusters to port and starboard. Integrating the TOW missile was not accomplished at the cost of other weaponry, for the inboard stub wing hardpoints could still be employed for the carriage of other items of ordnance such as the familiar 2.75in rocket pods or M18E1 Miniguns. Additional equipment associated with the new weapon included a helmet sight sub-system produced by Sperry Rand's Univac Division in order that the gunner could sight and shoot. The gun armament survived unchanged, and thus with a full bag of weaponry—TOW missiles, rockets and gun—the HueyCobra was now transformed into a most potent adversary, capable of engaging a variety of "soft", "medium hard" and "hard" targets with every prospect of success.

The evaluation of eight pre-production examples was undertaken by the Army during the course of 1973 and was sufficiently encouraging to warrant the procurement of "production" AH-1Q conversions, the first of which was delivered on 10 June 1975. Many of them ultimately found their way to US Army forces stationed in Europe, where they provided a welcome boost to the order of battle. It soon became evident, however, that the original Lycoming T53-L-13 engine was no longer satisfactory, fully laden AH-1Qs being what might politely be described as badly "winded", with consequent deleterious effects on performance. Eventually, surviving examples of the AH-1Q were further modified to AH-1S standard by both the parent company in the USA and by Dornier in West Germany.

The next model to appear was the AH-1R, which seems to have served principally as a kind of engine test-bed, concern over failings which had become

Below: The first member of the gunship helicopter family to acquire TOW capability was the AH-1Q, a total of 92 AH-1Gs being retrospectively modified to this configuration.



Above: Army evaluation of the AH-1Q was accomplished during 1973 and included numerous weapons-related trials. Here, a Cobra lets fly with a Hughes BGM-71 TOW missile.

apparent with the AH-1Q prompting both the Army and Bell to investigate ways of improving the helicopter's performance. Fitted with an Avco Lycoming T53-L-703 turboshaft in conjunction with a revised transmission unit, the AH-1R quickly demonstrated quite significant performance benefits, both in terms of disposable payload and with regard to hovering, manoeuvrability and acceleration. Only two examples of the AH-1R were actually produced, both being converted AH-1Gs, and the small number involved seems to support the claim that these were mainly intended to explore possible gains arising from the switch to a new model of the Avco Lycoming T53; further support for this theory is furnished by the fact that neither of the AH-1Rs incorporated provision for TOW armament.

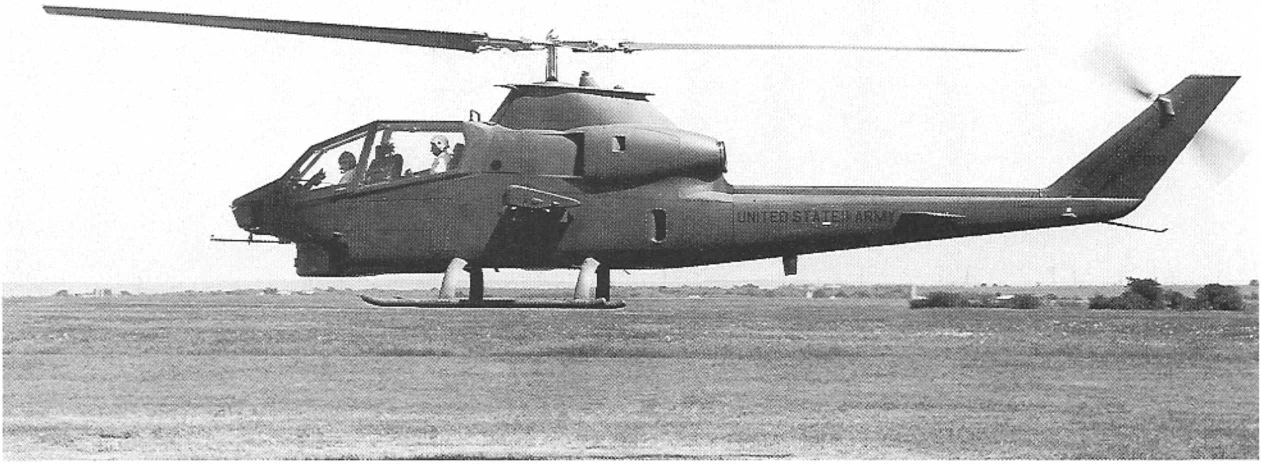
Performance boost

Between them, then, the AH-1Q and AH-1R may be said to have proved that the HueyCobra could be fitted with a new armament and a new engine, and all that remained was to integrate these separate lines of improvement into a single machine. Such a programme has indeed been implemented, resulting in the appearance of the AH-1S—which has itself been further enhanced since it began to join combat-ready elements of the US Army in the latter half of the 1970s.

In its initial form, the AH-1S represented a very real improvement over the AH-1G and AH-1Q, a marked boost in overall performance arising from the incorporation of the 1,360kW (1,825shp) Avco Lycoming T53-L-703 turboshaft engine, a revised gearbox and a new transmission unit rated at 962kW (1,290shp); TOW missile armament was also a standard feature, this model utilising the same eight-weapon layout as the earlier AH-1Q. Procurement for the Army began in the mid-1970s and was rather novel in that it was based on the acquisition of both new-build AH-1Ss as well as on the modernisation of existing AH-1Gs and AH-1Qs to AH-1S standard.

Needless to say, differences were evident from the outset, new examples of the HueyCobra appearing with flat-plate canopies designed to reduce the risk of visual detection by cutting down "glint" while many remanufactured examples retained the original style (although these have been gradually replaced). The first brand-new AH-1S to reach the Army was handed over on 16 March 1977, but concurrent deliveries of HueyCobras from both sources thereafter permitted Army units to be re-equipped rather more rapidly than would normally have been possible, and several hundred are now in service world-wide.

Configurations vary quite considerably, and in order to provide a clearer understanding of these it is best to examine the changes incorporated on



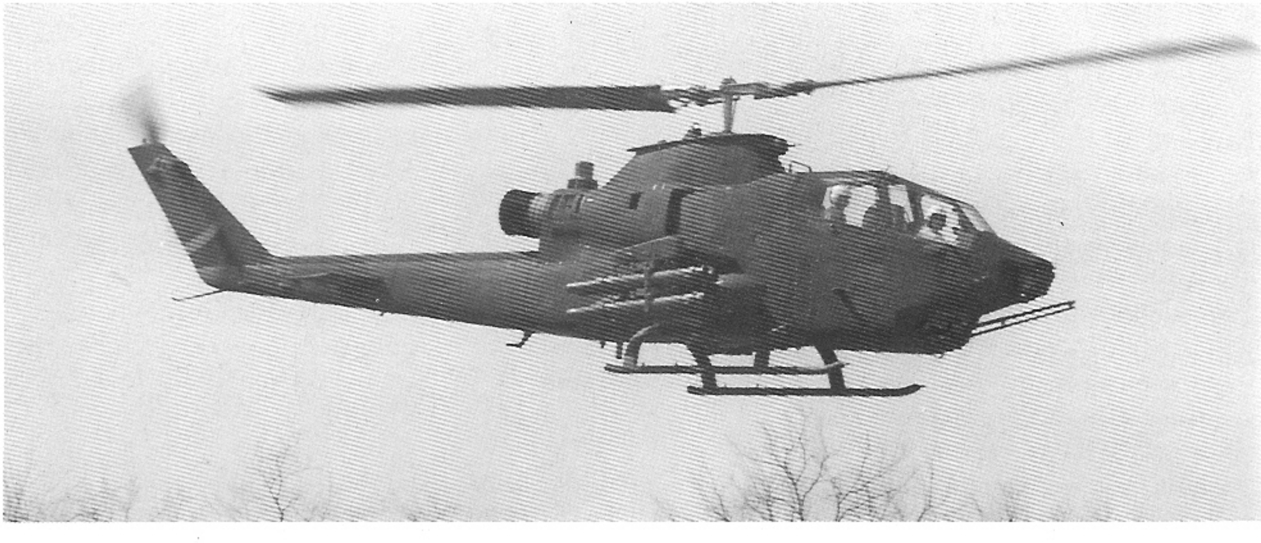
Above: **Several variants of the AH-1S exist, these differing with regard to armament and associated equipment although all are configured for operations with the TOW missile.**

new-build aircraft as production progressed. Remanufactured examples—known generally as "Modified AH-1S", or "Mod AH-1S" for short—do feature most of the improvements which are discussed in the following paragraphs and are eventually expected to adopt all of them.

In broad terms, the new-production programme has taken the form of a three-stage exercise, HueyCobra variants which have appeared since March 1977 being referred to as the "Production AH-1S", the "Up-gun AH-1S" and the "Modernised AH-1S", and care should be taken not to confuse the latter with the "Modified AH-1S". The progressive incorporation of new equipment has resulted in valuable gains in overall capability, and the ultimate HueyCobra is a tremendous improvement on the original AH-1G, as well as being far superior to the initial AH-1S model.

Features common to all three new-build subtypes are the M65 TOW missile system, a flat-plate canopy, a revised instrument panel layout intended to facilitate nap-of-earth (NOE) flight, a radar altimeter, continental USA (ConUS) navigation equipment, improved communications gear, an uprated T53-L-703 engine and transmission, push/pull anti-torque controls and, with effect

Below: Comparison of this AH-1S with that illustrated at the head of the page reveals a number of significant differences, the most visible being the much-revised exhaust nozzle.



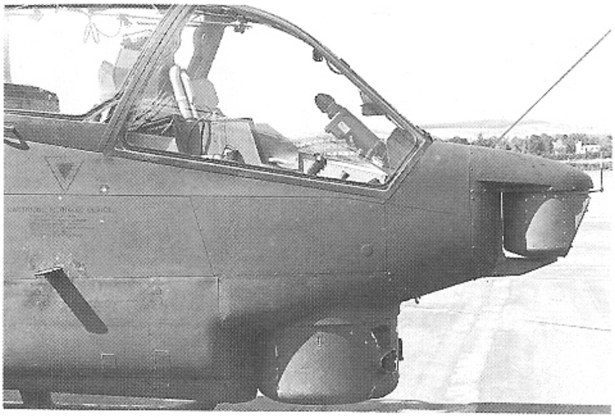
from the 67th example (77-22729), new, Kaman-developed, composite main rotor blades incorporating greater battle damage tolerance. The blades can reportedly absorb hits by weapons of up to 23mm calibre, and are instantly recognisable by virtue of their tapered chord and thickness over the outer 15 per cent.

New universal turret

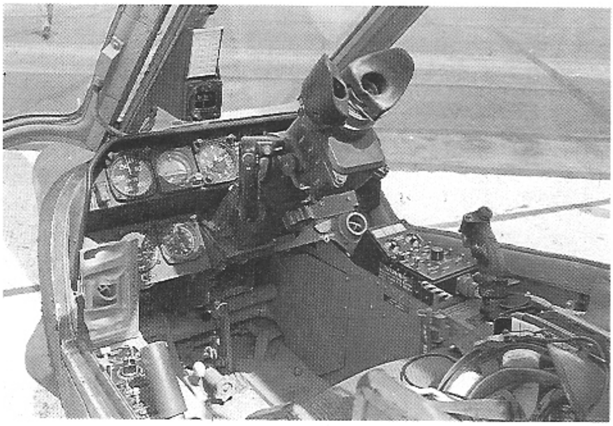
Deliveries of the so-called "Production AH-1S"—which introduced all of the above features apart from the new Kaman main rotor blades—got underway in March 1977, but it was not until August that year that the first combat-ready unit, the 82nd Airborne Division at Fort Bragg, North Carolina, began to be equipped with the type. Production of this variant was terminated in the autumn of 1978 with the delivery of the 100th example, Bell's Forth Worth factory then switching its energies to the "Up-gun AH-1S", 98 of which were produced and delivered to the Army between September 1978 and October 1979.

As its designation implies, this derivative featured changes to the armament, a new electrically powered General Electric universal turret being installed in place of the M28 sub-system which had served the HueyCobra well from the earliest days of combat in Vietnam. Compatible with either 20mm or 30mm weapons, this is principally intended to enhance the stand-off capability of the gun system.

The gun installation at present comprises the 20mm M197 three-barrelled cannon which has been used for many years by the Marine Corps on both the AH-1J and AH-1T and which was successfully demonstrated on a specially modified Army JAH-1G flying test-bed, the same helicopter having earlier taken part in trials with the Rockwell AGM-114 Hellfire laser-guided anti-armour missile. The ammunition capacity is identical, at 750 rounds, although the rate of fire appears to have fallen slightly, from 750 to 730 rounds per minute, whilst the field of fire differs only in that the upward elevation of the weapon is 20.5 degrees and the turret position can be controlled by either crew member by means of the M65 missile system telescopic sighting unit. As is the case with Marine Corps Cobras, the gun must be stowed before

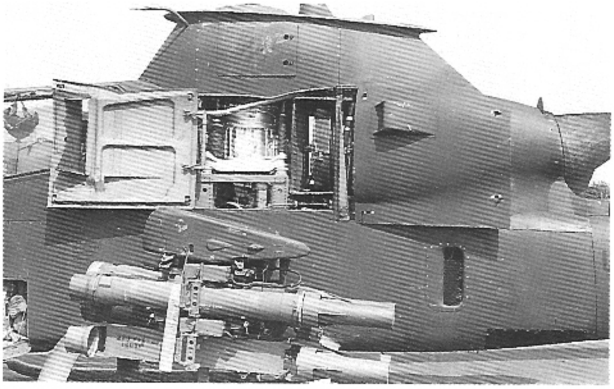


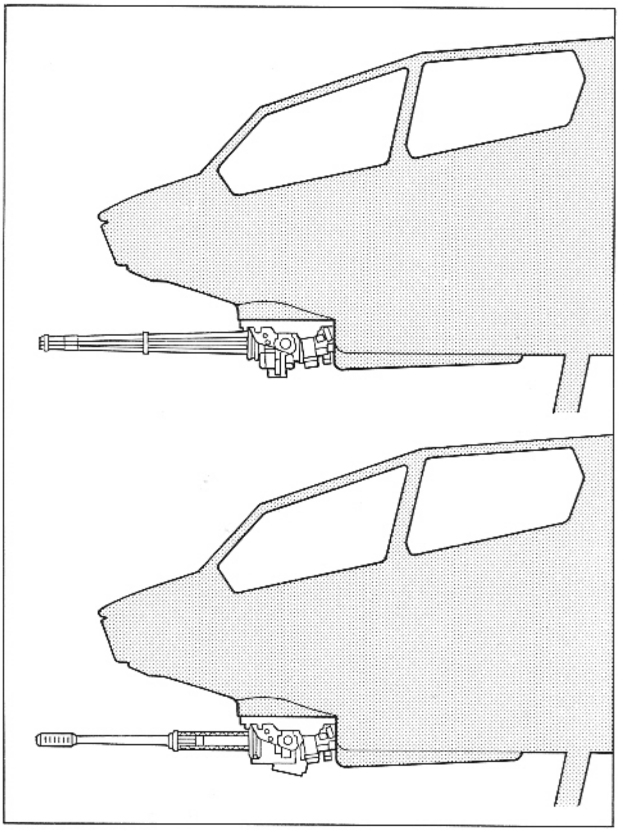
Above: Turret and TOW sight detail may be discerned in this view of the forward fuselage of an AH-1S to early production standard. Most, if not all, operational HueyCobras now feature flat-plate canopies to eliminate "glint" and reduce the risk of detection when operating over the battlefield.



Above: The HueyCobra's front cockpit is usually occupied by the co-pilot/gunner and is dominated by the sighting device used in conjunction with the TOW missile. Instrumentation is relatively unsophisticated. The colouring of both front and rear cockpits is basically matt medium grey.

Below: Launchers for the BGM-71 TOW missile and transmission detail may be seen in this close-up view of the AH-1S centre-section. A maximum of eight missiles may be carried at any given time, reloading being a fairly simple exercise and one which can be accomplished in the field.





Above: Introduced to service on the Up-Gun AH-1S, General Electric's new universal turret has already demonstrated compatibility with either 20mm or 30mm weapons. The former (depicted at top) is currently the favoured gun armament but the latter (above) may eventually be adopted.

discharging weaponry from the stub wing hardpoints. The additional electrical power required to operate this new system is furnished by a 10kVA alternator.

Another new feature of the Up-gun AH-1S is the Baldwin Electronics M138 stores management sub-system, which looks after 2.75in rocket armament. This HueyCobra derivative is compatible with five types of launcher, pod capacity varying from seven to 19 rockets. The M138 enables crew members to designate and fire, singly, in groups or in salvo, various combinations of rocket armament.

The ultimate HueyCobra

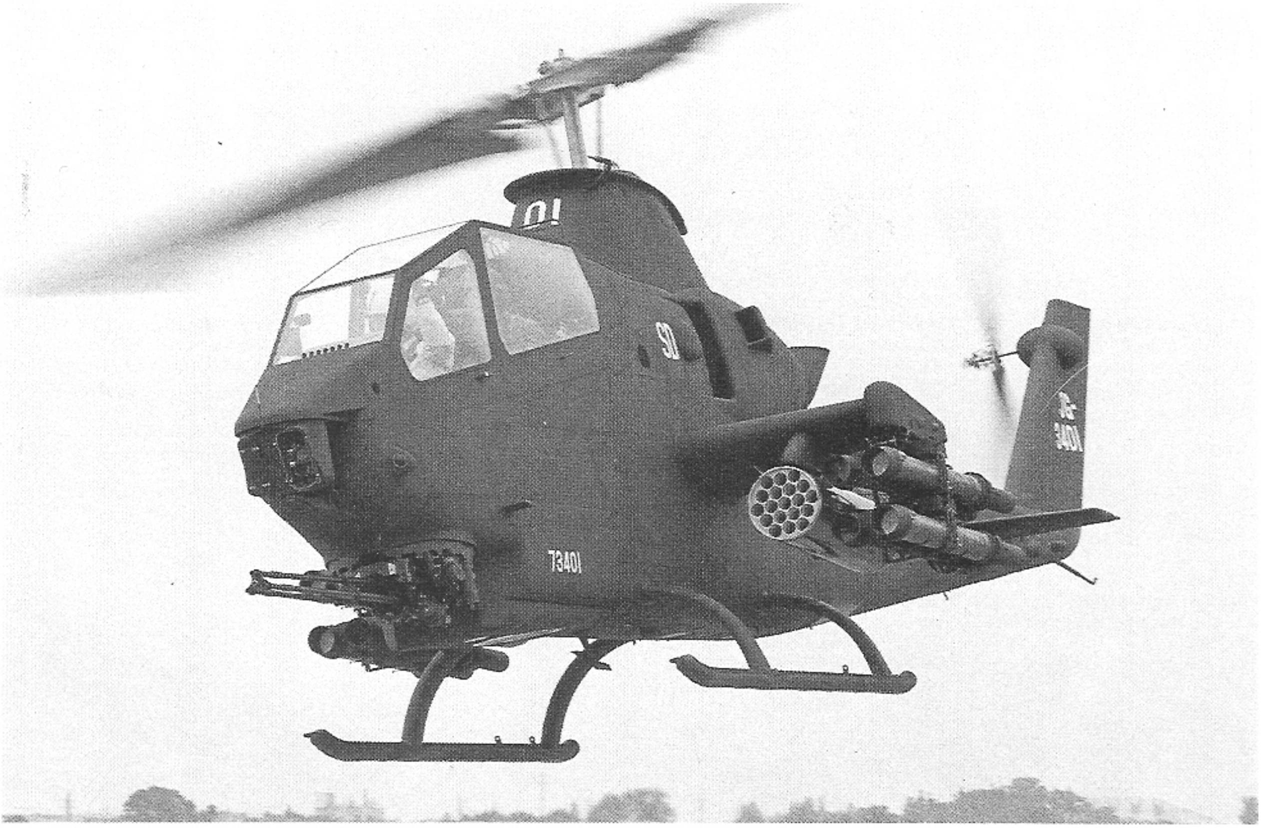
The ultimate HueyCobra in service with the US Army is the Modernised AH-1S, the first example of which (78-23093) appeared in late 1979. New features were many and varied, but perhaps the most important was the provision of a completely revised fire control sub-system incorporating such "goodies" as a Hughes laser rangefinder device accurate over 32,800ft (10,000m), a Rockwell AN/AAS-32 airborne laser tracker set, a Teledyne Systems digital ballistics computer to aid gun and rocket firing, a low-airspeed sensor in a boom protruding forward from the cockpit, and a Kaiser head-up display (HUD) unit for the pilot.

Efforts were also directed at reducing the helicopter's vulnerability to enemy action, these including infra-red "footprint" suppression measures such as the "black hole" heat-dissipating exhaust efflux nozzle and the installation of an AN/ALQ-144 infra-red jamming device and an AN/APR-39 radar warning receiver which notifies the crew when the AH-1S is being "painted" by enemy radar.

Exports and licence manufacture

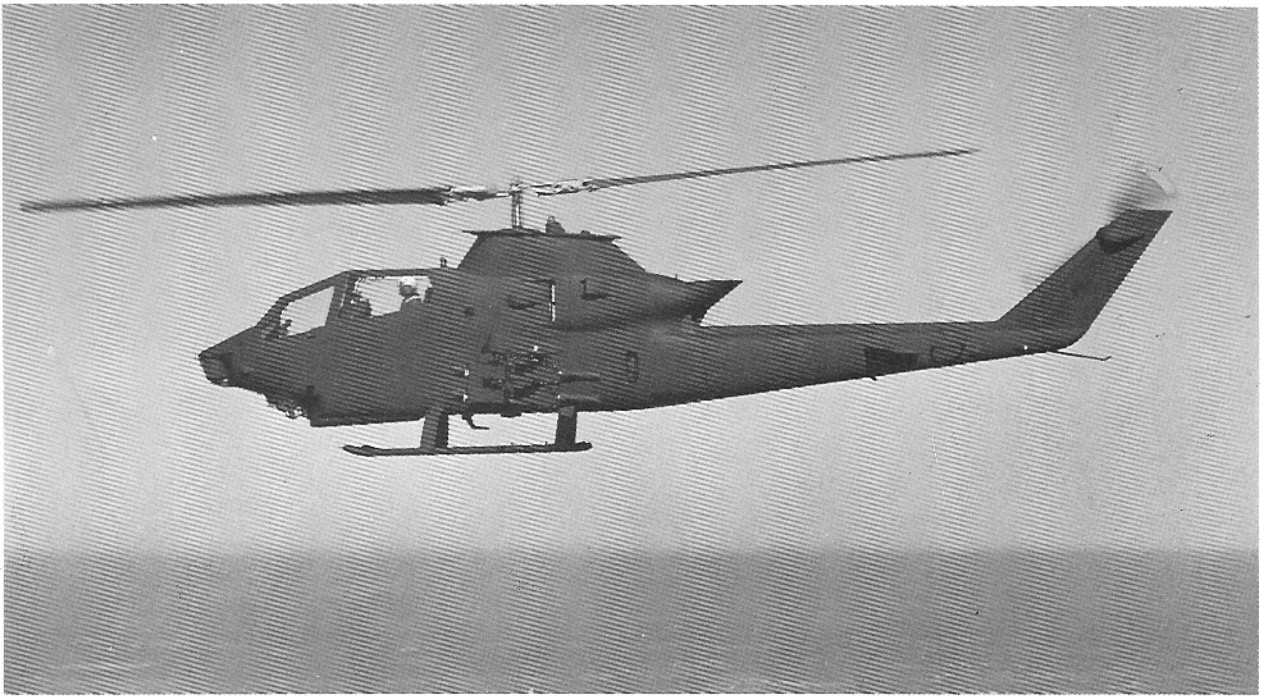
Production of the Modernised AH-1S totalled 99 for the Army, a further 50 examples being obtained for service with the Army National Guard. This model has also found favour on the export market, Congressional approval being given for supplying it to such nations as Greece, Israel, Jordan, Pakistan, Thailand and Turkey. As a consequence of these export orders, manufacture of the Modernised AH-1S is, at the time of writing, still in progress, the Fort Worth production line having been augmented in the early 1980s by an assembly facility in Japan.

Japan's evaluation of the HueyCobra was a fairly protracted affair. A couple of US-built AH-1Ss were purchased, and deliveries took place in June 1979 and May 1980. Following the negotiation of a licence-production agreement, the initial order—covering 17 locally manufactured examples—was placed in 1982, and the first Fuji-built machine made its maiden flight on 6 July 1984, being delivered to the JGSDF later that year. Operational deployment began in 1985 with the activation of an anti-tank echelon as part of the Northern Army Aviation Group. Since then, the quantity on order has been steadily increased towards the eventual goal of 54 Modernised AH-1S HueyCobras, current plans by the Japanese Ground Self-Defence Force anticipating the organisation of at least three anti-tank helicopter squadrons.



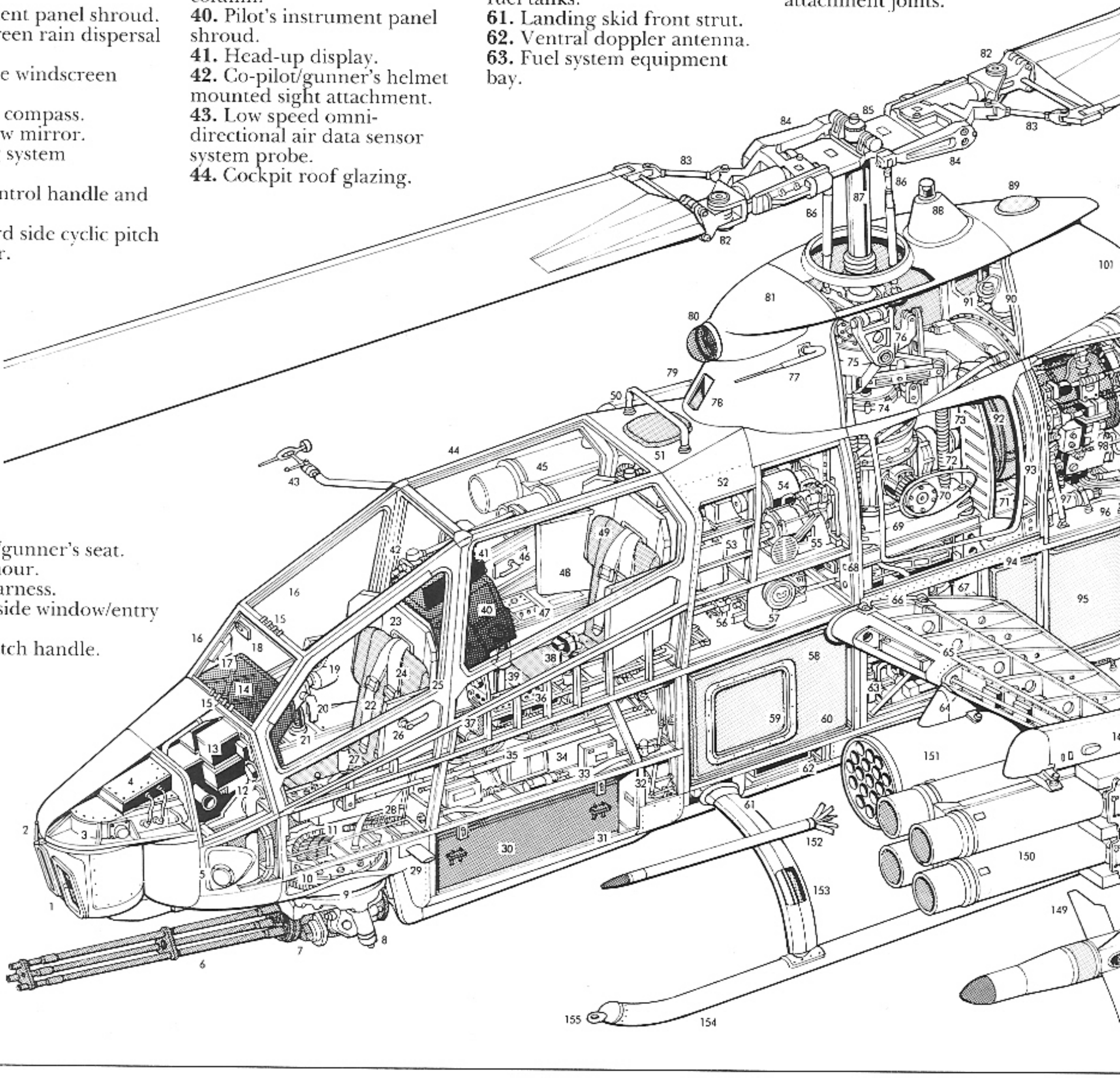
Above: Carrying a full bag of TOW missiles and FFAR pods, the first AH-1S HueyCobra to be delivered to the Japanese Ground Self-Defence Force was handed over in June 1979. A lengthy and exhaustive service evaluation was conducted with two helicopters before licence production began in 1983.

Below: Devoid of any identification markings and with the nose-mounted gun armament still to be fitted, one of the two AH-1Ss produced by the parent company for evaluation by the Japanese undergoes flight testing with a Bell pilot at the controls. Japan currently hopes to purchase 54 HueyCobras.

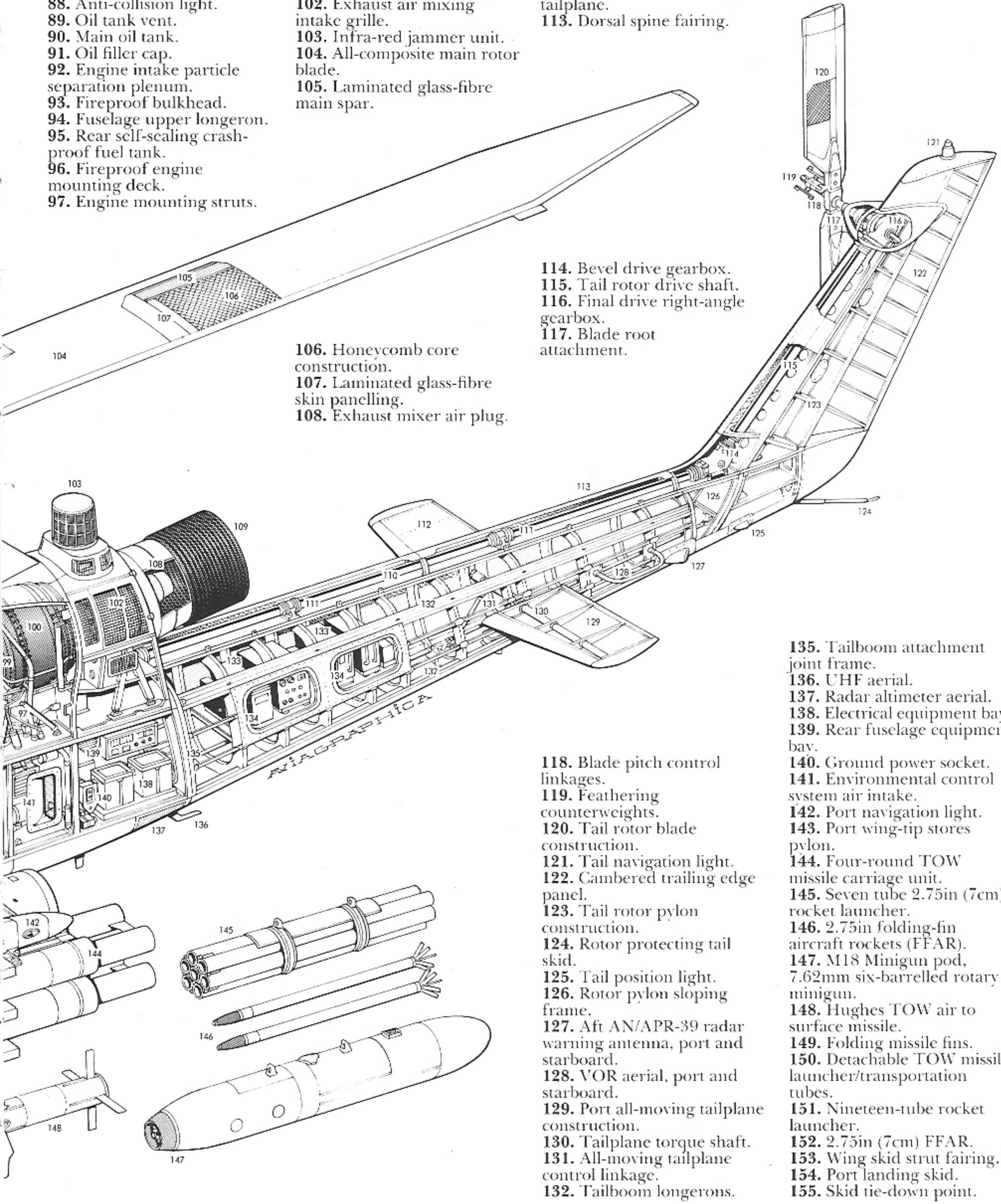


BELL "MODERNISED AH-1S" HUEYCOBRA CUTAWAY

1. M65 Laser Augmented Airborne TOW (LAAT) sighting unit.
2. Sight visual position indicator.
3. Gimballed sight mounting.
4. Laser electronics unit.
5. Forward AN/APR-39 radar warning receiver, port and starboard.
6. Cannon barrels.
7. M197 20mm three-barrelled rotary cannon.
8. Cannon elevation control gear.
9. Swivelling gun turret mounting.
10. Azimuth control gear ring.
11. Ammunition feed chute.
12. Co-pilot/gunner's instrument panel.
13. AN/APX-100 lightweight IFF unit.
14. Instrument panel shroud.
15. Windscreen rain dispersal air ducts.
16. Flat plate windscreen panels.
17. Standby compass.
18. Rear view mirror.
19. Sighting system viewfinder.
20. Sight control handle and trigger.
21. Starboard side cyclic pitch control lever.
22. Co-pilot/gunner's seat.
23. Seat armour.
24. Safety harness.
25. Cockpit side window/entry hatch.
26. Entry hatch handle.
27. Port console mounted collective pitch control lever.
28. Energy absorbing seat mountings.
29. Boarding step.
30. Ammunition magazine, 750 rounds.
31. Ammunition bay access door, port and starboard.
32. Automatic flight control system equipment (AFCS).
33. Lateral equipment ducting.
34. Armoured cockpit sidewalling.
35. Control linkages.
36. Port side console panel.
37. Anti-torque rudder pedals.
38. Collective pitch control lever.
39. Cyclic pitch control column.
40. Pilot's instrument panel shroud.
41. Head-up display.
42. Co-pilot/gunner's helmet mounted sight attachment.
43. Low speed omni-directional air data sensor system probe.
44. Cockpit roof glazing.
45. Starboard TOW missile launchers.
46. Pilot's starboard side entry hatch.
47. Starboard side console panel.
48. Seat armour.
49. Pilot's seat.
50. HF aerial rail.
51. DF loop aerial.
52. Skin panelling coated with radar-absorbent material.
53. Upper fuselage equipment bay.
54. Generator.
55. Hydraulic system reservoir.
56. Control linkage mixing unit.
57. Position of refuelling connection on starboard side.
58. Forward fuselage self-sealing fuel tank, total fuel capacity 259 US gal. (980l).
59. Fuel tank access panel.
60. Crash-resistant, bag-type fuel tanks.
61. Landing skid front strut.
62. Ventral doppler antenna.
63. Fuel system equipment bay.
64. Port inboard stores pylon.
65. Port stub wing construction.
66. Stub wing attachment joints.
67. Gearbox oil sump.
68. Wing/fuselage/gearbox main frame.
69. Anti-vibration gearbox mounting.
70. Alternator.
71. Engine air intake.
72. Rotor head control jacks (3).
73. Gearbox input shaft.
74. Main gearbox.
75. Swash plate mechanism.
76. Rotor head torque link.
77. Pitot head.
78. Fresh air intake.
79. Starboard wing tip stores pylon.
80. Laser spot tracker housing.
81. Rotor head fairing.
82. Rotor blade root attachment joints.



83. Drag links.
84. Blade pitch control links.
85. Teetering rotor head attachment.
86. Blade pitch control rods.
87. Main rotor mast.
88. Anti-collision light.
89. Oil tank vent.
90. Main oil tank.
91. Oil filler cap.
92. Engine intake particle separation plenum.
93. Fireproof bulkhead.
94. Fuselage upper longeron.
95. Rear self-sealing crash-proof fuel tank.
96. Fireproof engine mounting deck.
97. Engine mounting struts.
98. Engine fuel control equipment.
99. Avco-Lycoming T53-L-703 turboshaft engine.
100. Engine turbine section.
101. Rotor head tail fairing.
102. Exhaust air mixing intake grille.
103. Infra-red jammer unit.
104. All-composite main rotor blade.
105. Laminated glass-fibre main spar.
106. Honeycomb core construction.
107. Laminated glass-fibre skin panelling.
108. Exhaust mixer air plug.
109. Infra-red suppression exhaust nozzle.
110. Tail rotor transmission shaft.
111. Shaft bearings.
112. Starboard all-moving tailplane.
113. Dorsal spine fairing.
114. Bevel drive gearbox.
115. Tail rotor drive shaft.
116. Final drive right-angle gearbox.
117. Blade root attachment.
118. Blade pitch control linkages.
119. Feathering counterweights.
120. Tail rotor blade construction.
121. Tail navigation light.
122. Cambered trailing edge panel.
123. Tail rotor pylon construction.
124. Rotor protecting tail skid.
125. Tail position light.
126. Rotor pylon sloping frame.
127. Aft AN/APR-39 radar warning antenna, port and starboard.
128. VOR aerial, port and starboard.
129. Port all-moving tailplane construction.
130. Tailplane torque shaft.
131. All-moving tailplane control linkage.
132. Tailboom longerons.
133. Avionics equipment bays.
134. Avionics bay access doors.
135. Tailboom attachment joint frame.
136. UHF aerial.
137. Radar altimeter aerial.
138. Electrical equipment bay.
139. Rear fuselage equipment bay.
140. Ground power socket.
141. Environmental control system air intake.
142. Port navigation light.
143. Port wing-tip stores pylon.
144. Four-round TOW missile carriage unit.
145. Seven tube 2.75in (7cm) rocket launcher.
146. 2.75in folding-fin aircraft rockets (FFAR).
147. M18 Minigun pod, 7.62mm six-barrelled rotary minigun.
148. Hughes TOW air to surface missile.
149. Folding missile fins.
150. Detachable TOW missile launcher/transportation tubes.
151. Nineteen-tube rocket launcher.
152. 2.75in (7cm) FFAR.
153. Wing skid strut fairing.
154. Port landing skid.
155. Skid tie-down point.



Above: Pictured with some of the many items of armament that may be employed in combat, this AH-1S is unusual by virtue of the fact that it features a four-bladed main rotor.

As well as the various combat-rated models of the AH-1S, a small number of remanufactured HueyCobras have been converted to TH-1S standard, the ten examples involved in this relatively modest project all being assigned to training duties, although, perhaps surprisingly, not in support of the large HueyCobra-equipped community; rather, their principal function is intimately associated with the Hughes AH-64A Apache, a type which is now in the process of supplanting the Bell design as the US Army's main battlefield helicopter.

"Night Stalker"

Modifying the AH-1S to TH-1S configuration was undertaken by Northrop's Electro-Mechanical Division and entailed the fitting of a package of specialised equipment which is known collectively as "Night Stalker". Delivery of the first conversion took place at the end of July 1984, and all ten TH-1Ss had been turned over to the Army by April 1985. The training helicopters are provided with a pilot's night-vision sensor (PNVS), plus associated visual and avionics systems, blue instrument lighting permitting the use of night-vision goggles. Aircraft modified in this way are now being employed to train Army pilots in the complexities of Honeywell's integrated helmet and display sighting system (IHADSS) and the Martin Marietta forward-looking infra-red (FLIR) night-vision system, both of which are elements in the AH-64 fit.

Below: All-weather capability has been significantly improved through the addition of a forward-looking infra-red night vision device made by the Hughes Aircraft Company.

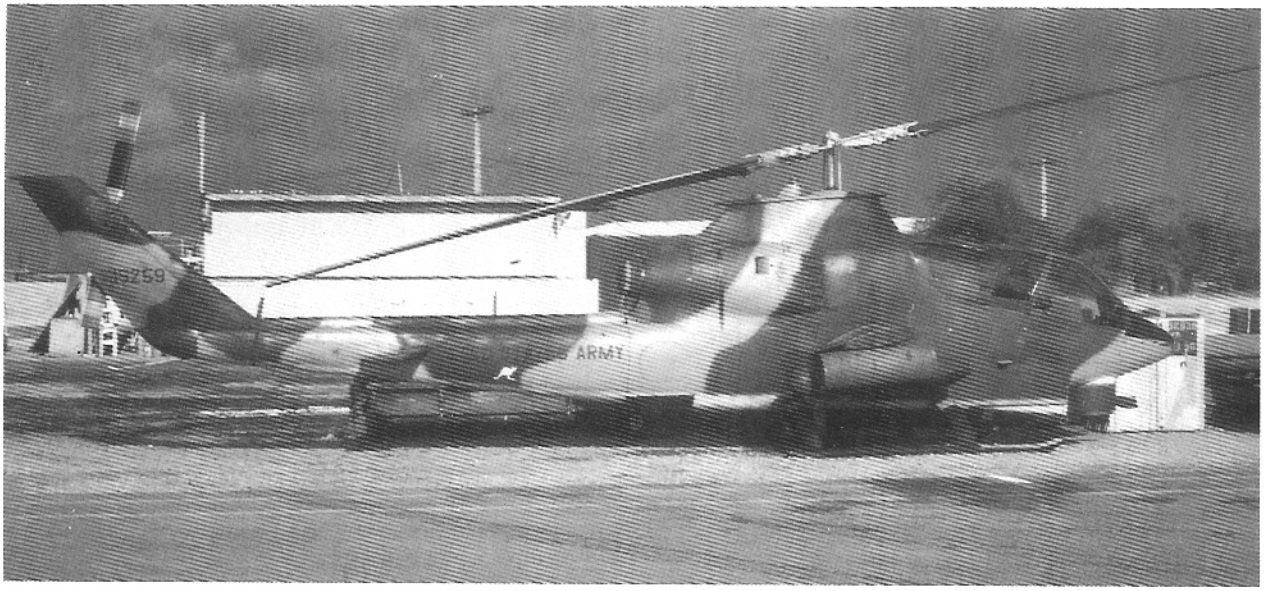
5

The Cobra in Service

As HAS ALREADY been made clear, the AH-1G HueyCobra was conceived and developed in an atmosphere of great urgency, the delivery of production-configured helicopters beginning less than two years after the type's maiden flight. Indeed, so pressing was the need for a dedicated battlefield helicopter that the Army elected to make a daring break with tradition, and much of the formal operational training was actually accomplished in Vietnam, it having previously been the norm to undertake the initial phase of deployment in the USA where the support infrastructure was far better equipped to deal with any problems. In the case of the AH-1G, however, deployment to the war zone took place within a few weeks of the first examples being accepted, an initial batch of half a dozen HueyCobras reaching Vietnam in autumn 1967.

The task of introducing Bell's newest creation to combat duty in South-East Asia fell to an organisation known as the New Equipment Training Team (NETT) at Vung Tau, which received its first AH-1Gs on 1 September 1967. Just over two weeks later, in-theatre training got under way, aspects of the formal syllabus including the transition of those pilots selected to introduce the HueyCobra to combat. At the same time, the Cobra NETT organisation was tasked with instructing ground-based support troops in the intricacies of the AH-1G, attention

Below: A typical South-East Asian scene as Army AH-1G HueyCobras are prepared for the day's missions. Armed helicopters often worked over the so-called "free-fire" zones.



Above: A highly unusual USAF-type camouflage pattern and a kangaroo "zap" adorn AH-1G 66-15259 of the Army's Cobra New Equipment Training Team at Vung Tau, December 1967.

being paid to such diverse aspects as airframe, engine, armament and avionics maintenance. It says a lot for both the HueyCobra and Bell that this programme was carried through swiftly and with few problems.

The first "customer" to undergo training with the Cobra NETT was the 334th Assault Helicopter Company (AHC) at Bien Hoa, and this unit soon returned to action, playing a particularly important part in the defence of the US air bases at Tan Son Nhut and Bien Hoa during the so-called Tet Offensive of February 1968. Such was the determination of the Viet Cong guerrillas that they even penetrated the airfields, and it fell to the HueyCobras and other armed helicopters to flush them out, a task which was not without hazard. One notable incident actually occurred at the 334th's home base of Bien Hoa, where a section of AH-1Gs engaged a force of about 100 well-entrenched Viet Cong, making repeated attacks at extremely low level and employing machine-gun fire to devastate the enemy positions.

Battle damage

Needless to say, the Viet Cong did not take kindly to this helicopter-borne intervention, firing back with virtually everything they had, and there were some instances of AH-1Gs sustaining considerable battle damage, one helicopter having to perform a running landing at Bien Hoa after taking hits which knocked out the tail rotor drive shaft, holed the fuel tanks and made the instrument panel take on the appearance of a Christmas tree as virtually every warning light and indicator was illuminated. Within minutes, though, the pilot had boarded another Cobra and headed back to the fray. Once the dust had settled, those involved in the quite intense fighting readily acknowledged that the HueyCobra had been instrumental in defeating the Viet Cong.

Subsequently, personnel from Cobra NETT visited other units to supervise the re-equipment programme, standardise operational procedures and liaise with Army elements in the USA on the subject of operational and logistical matters. One novel problem which manifested itself concerned HueyCobra crews who could no longer determine quite so readily when they were themselves coming under enemy fire. On the Iroquois, it was usual to go into battle with the side doors secured in the open position—indeed, this was essential if the gunners were to bring their weapons to bear—and enemy firing was quite audible. In the AH-1G, however, the two-man crew were to some extent isolated from clues of this kind, no longer being able to listen out for the sounds of battle. At the same time, of course, the extra eyes and ears of the Iroquois gunners were not available and there were instances of HueyCobras running into serious trouble, although the provision of armour plating combined with the helicopter's superior performance generally meant that the AH-1G was well able to look after itself in all but the most "hairy" situations. Nevertheless, it was found desirable and necessary to modify some of the tactics and techniques that were employed in combat operations involving the use of helicopters.

"Free-fire" zones

Within a matter of months, the number of HueyCobras present in Vietnam had risen dramatically, and the Army was fast beginning to perfect the tactical manual which had required a fair amount of rewriting. Assault Helicopter Companies using the HueyCobra proliferated rapidly, and the type also found its way into combat echelons of the highly mobile Air Cavalry.

Escort duty accounted for a fair proportion of the work undertaken by HueyCobra-equipped units, but the AH-1G was also used extensively in the so-called "free-fire" zones, cells of machines ranging far and wide and engaging all manner of targets. One innovative feature—which utilised the high degree of mobility possessed by the helicopter—was the "Pink Team", in which an AH-1G was paired with an OH-6A Cayuse light observation helicopter to perform reconnaissance by fire. The distribution of Air Cavalry assets in this way permitted large areas to be covered, and the constant use of radio communication enabled rapid responses to be made and, when necessary, the deployment of additional forces to be arranged.

At the same time, the heavily armed HueyCobra was in many ways an ideal vehicle for the close air-support task, there being many instances of AH-1Gs both detecting and engaging enemy troop concentrations. Often operating within yards of friendly forces, the AH-1G was seldom weather-limited and, as a result, was able to furnish much needed support when more conventional forms of "tactical air" were either grounded or unable to help.

Improved armament

Inevitably, of course, there were difficulties. The AH-1G's armament, while impressive, was still deficient in certain respects, the 0.30-calibre (7.62mm) machine gun, for example, lacking punch. Attempts to rectify this led to the deployment of the M35

Below: Many of the HueyCobras which saw combat in South Vietnam acquired personal touches, these being exemplified by the name "Patricia Ann" on the nose of this machine.

PATRICIA ANN
UNITED STATES ARMY

armament sub-system, which featured an M61 20mm cannon, a very accurate weapon at ranges up to about 7,000ft (2,100m). Enemy armoured fighting vehicles were only occasionally encountered, but it soon became apparent that the AH-1G was ill-equipped to deal with them. In consequence, the existing rocket armament was also improved, the adoption of high-explosive anti-tank projectiles theoretically increasing capability. However, it should be noted that these weapons were only really effective in instances where a direct hit was obtained, and they did have one serious shortcoming, since in order to achieve its objective it was necessary for the AH-1G to close to within 500–1,000m (1,640–3,280ft) of the target, and at this distance the HueyCobra itself became vulnerable to defensive fire put up by the tank's 12.7mm gun and that of associated enemy infantry.

Marine Corps experience

The only other element of the US armed forces to employ the basic AH-1G HueyCobra in Vietnam was the Marine Corps, which received the first of an eventual total of 38 helicopters of this type in February 1969. The first few USMC Cobras were actually operated by the Army, being employed to train an initial cadre of Marine pilots and co-pilot/gunners at Hunter Army Air Field, Georgia. Training was accomplished alongside Army personnel, and some idea of the superior qualities of the Marines can be gained from the fact that, in a class of 39, the four USMC candidates occupied the first four places on graduation.

The deployment of Marine Corps AH-1Gs to South-East Asia followed shortly afterwards, an initial batch of four helicopters arriving on 10 April. Assigned to VMO-2 at Da Nang, they entered combat just over a week later, on 18 April, when a single example performed a casevac escort mission. During the next few months, the number on hand rose steadily towards the planned authorised complement of 24, a level which was attained by the beginning of December. In the event, however, VMO-2's association with the HueyCobra proved to be short-lived, for, on 16 December 1969, all 24 AH-1Gs were turned over to Light Helicopter Squadron HML-367 at the major Marine facility at Marble Mountain as part of an extensive reorganisation of Vietnam-based light observation and attack elements.

Below: A Cobra from the 2nd Battalion, 20th Artillery Regiment (Aerial Rocket Artillery), flies low over typical South-East Asian terrain during combat operations.

Above: Adorned with a spectacular looking "shark's mouth" motif, an Army AH-1G flies low over the sea while escorting Marine Corps CH-46 troop-carrying helicopters near Hue.

As had been the case with the Army, initial Marine experience with the HueyCobra resulted in a most favourable assessment. Indeed, in a report compiled in early July 1969, it was stated that, when compared with the UH-1E Iroquois, the AH-1G was "a far superior weapons platform precluding the need to fly rocket and gun runs below 1,000ft for the required accuracy". Elsewhere in this report, the AH-1G was described as having "a much improved armament system that provides greater firepower and flexibility. . . and permits steeper dive angles . . . providing greater accuracy". Finally, cruise speed was "compatible with that of transport helicopters, allowing the AH-1G the capacity to lead troop transport helos into the objective area and be able to loiter overhead for an entire lift". All in all, it was a most flattering evaluation, about the only problem being the supply of spares, some delays having apparently been experienced. The subsequent 1971 deployment of the AH-1J version, which offered greater safety margins by virtue of being twin-engined, eliminated one major worry for the Marines, and this model was also possessed of superior armament in the shape of the three-barrelled M197 gun, a far more effective weapon and one that was soon put to good use.

In Vietnam, of course, the combat environment was what might fairly be described as "permissive" when compared with the situation which would be likely to prevail in any future European war. This is not to say that combat in South-East Asia was not without hazard, but rather that the array of weapons available to Warsaw Pact forces is infinitely more fearsome, the intervening period having witnessed the development and deployment of new and ever more deadly threats to the continued well-being of both the battlefield helicopter and its crew. Targets, too, have changed. AFVs now constitute the primary objective, and this has resulted in the addition of new weaponry such as the TOW missile which now forms the key element of the HueyCobra's impressive arsenal. The availability of new weapons like TOW has been accompanied by improvements to the sensor fit, and the contemporary Cobra is indeed a very different animal from that which first undertook combat nearly two decades ago.

Changes such as these have gone hand in hand with changes in tactics, HueyCobra operations now being of a more covert nature than was the case in Vietnam where massed helicopter assaults were commonplace. Today, "stealth" is very much the watchword, with small, semi-autonomous groups of scout and armed helicopters deployed around the battlefield.

“Nap of earth” flying

Current Army doctrine, as practised in Europe, appears to be based on the use of “five-by-three” teams, made up of five AH-1Ss and three OH-58 Kiowa scout helicopters, a typical Attack Company being able to field four such teams. Low-level and ultra-low-level flying is the norm, skills of this kind being constantly honed for it is readily acknowledged that survival may ultimately depend on such expertise.

Colloquially known as “nap of earth” (NOE), the lowest of low-level flight may be likened to stalking an enemy, AH-1 and OH-58 helicopters operating “down amongst the weeds”. At such low levels, of course, speed is no longer the prime concern, and helicopters engaged in this kind of flying often proceed at little more than walking pace, taking full advantage of any cover that is available.

Once in contact with enemy forces, they will of course have to “unmask” themselves if they are to bring their weapons to bear. Since TOW requires the designated target to be constantly “illuminated” until the moment of missile impact, it is clear that this represents the maximum time of vulnerability. The deployment of a “fire and forget” weapon such as Rockwell’s Hellfire will reduce the risk, but although this missile is to be used by the Improved SeaCobras of the Marine Corps there appear to be no plans to install it on the Army machines.

So as to limit the helicopter’s dependence on the major Army installations which are likely to be targets in a conflict, the service does plan to make extensive use of detached elements operating from remote sites. A key aspect here is the forward-area rearming and refuelling point (FARRP). It is possible to fuel and arm five AH-1Ss and three OH-58s in about 15 minutes, and this concept of operations is practised regularly, in both normal training and during major NATO-sponsored manoeuvres such as “Certain Encounter”.

As far as export customers are concerned, operational doctrine probably follows much the same lines as that of the United States, although one of Israel’s HueyCobras has recently participated in a daring rescue. This concerned the recovery of a Phantom crew member who had been shot down over the Lebanon. Managing to evade capture, he was eventually retrieved by a HueyCobra, a process which involved him hanging on to the tubular skid undercarriage. Once out of immediate danger, the

Below: With the Mekong River visible below, gun- and rocket-armed HueyCobras set course for one of the numerous “free-fire” areas to be found in South Vietnam.

AH-1 landed in order that the passenger might be more securely attached by means of rope, and, lashed to the undercarriage in this way, he completed his journey to safety in Israel.

Cobra colour schemes

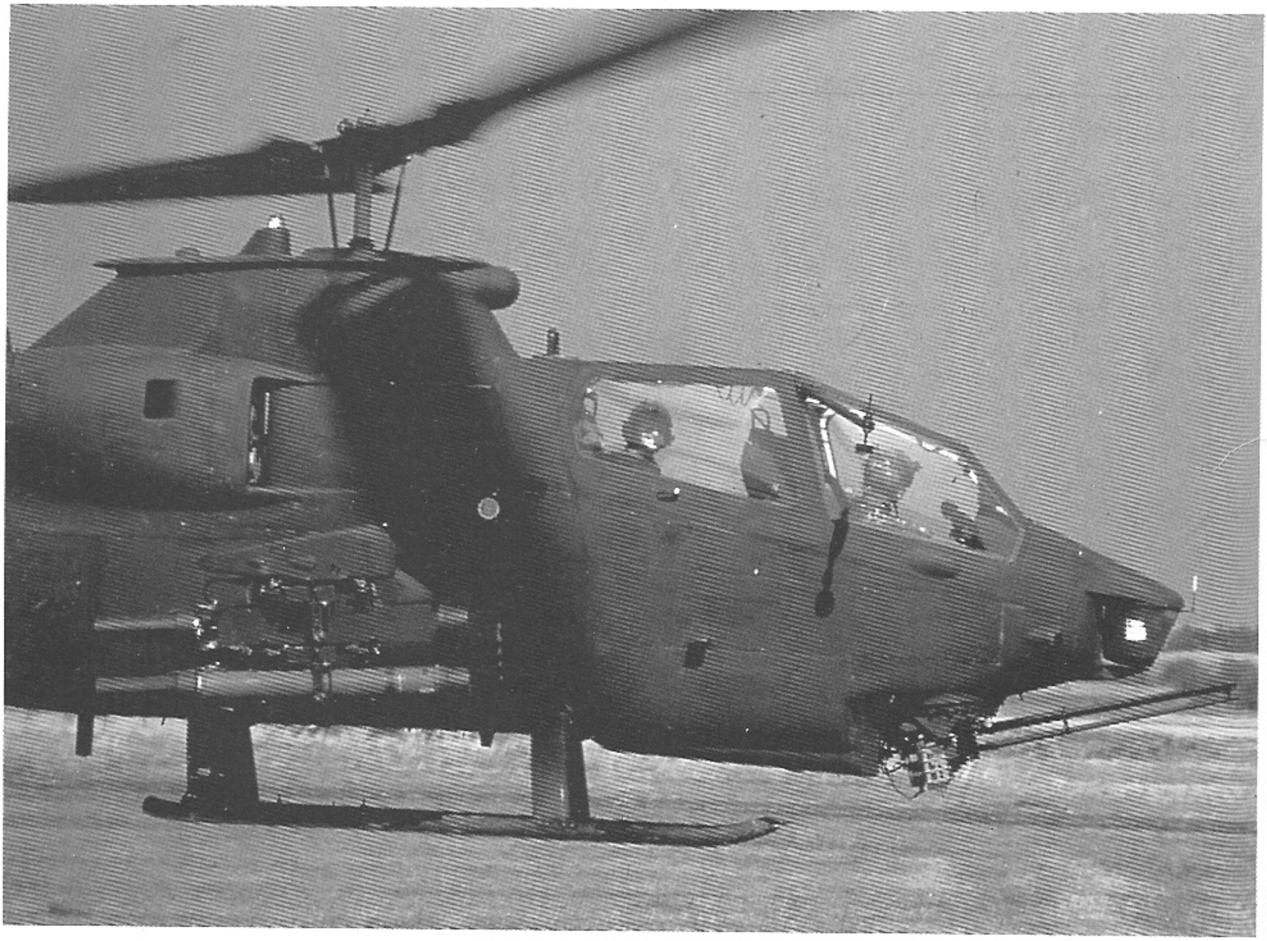
On the subject of colours and markings, the HueyCobra has never been noted for dazzling variety, although during the Vietnam War many Army examples donned fearsome "shark's mouth" motifs, these most appropriately being added in the vicinity of the nose-mounted gun turret. In general, however, the helicopter employed an olive drab overall paint scheme in conjunction with black Army inscriptions and tail numbers, individual unit insignia being limited mainly to geometric shapes, although some examples did display crossed cannon and sabres or unit shields. More recently, infra-red suppressing drab green—again with black titles and tail numbers—has become standard, but the individual touches provided by unit insignia are no longer apparent, at least as far as US Army Europe HueyCobras are concerned.

Marine Corps SeaCobras were, initially, rather more attractive, if only by virtue of the fact that the basic green paintwork was much brighter than that used by the Army. Service inscriptions, warning notices, national insignia and unit code letter combinations were of the high-visibility kind, although, once again, unit insignia were evidently discouraged.

More recently, USMC AH-1 SeaCobras have become far less "visible", a much darker matt green overall paint scheme having been adopted, initially on the AH-1Ts and eventually on the AH-1Js. Markings such as national insignia and code letters have also been toned down, with the result that Marine gunships are now almost as uninteresting to look at as those of the Army!

As for export HueyCobras, these, for the most part, seem to feature colour schemes which are similar to those employed by US Army examples. Certainly, Japanese and Pakistani AH-1Ss appear virtually indistinguishable, apart from the fact that the national insignia are of course different. Israeli machines, on the other hand, vary to a quite marked degree in that they seem to have standardised on a desert camouflage finish. One Israeli AH-1S is known to employ an overall tan colour scheme relieved only by the "Star of David" national marking, a small unit badge on the fin and a three-digit serial number on the front of the rotor housing and the tail. Desert camouflage, embodying various shades of tan and brown, was also applied to the Iranian AH-1J SeaCobras.

Below: Current operational doctrine lays heavy emphasis on flight at extremely low levels. Here, an AH-1S demonstrates a typical altitude for "nap of earth" flying.



Above: One of the most recent attempts at enhancing the capability of the Army's fleet of AH-1S HueyCobras centres around the fitment of a new gun, the M197 three-barrelled 20mm cannon now being standard equipment. This weapon has been inherited from the Marine Corps AH-1J and AH-1T variants and comes complete with 750 rounds of ammunition.

APPENDIX I: SPECIFICATION DATA—AH-1S MODEL

Dimensions

Main rotor diameter:	44ft 0in (13.41m)
Tail rotor diameter:	8ft 6in (2.59m)
Wing span:	10ft 9in (3.28m)
Length overall, rotors turning:	53ft 1in (16.18m)
Length of fuselage:	44ft 7in (13.59m)
Width of fuselage:	3ft 3in (0.99m)
Height overall:	13ft 5in (4.09m)
Elevator span:	6ft 11in (2.11m)
Main rotor disc area:	1,520.53sq ft (141.26sq m)
Tail rotor disc area:	56.75sq ft (5.27sq m)

Weights

Operating weight empty:	6,479lb (2,939kg)
Maximum take-off and landing weight:	10,000lb (4,535kg)

Performance

Never-exceed speed (with TOW):	170kt (195mph, 315km/h)
Maximum level speed at sea level:	123kt (141mph, 227km/h)
Vertical climb rate at sea level:	1,620ft/min (494m/min)
Service ceiling:	12,200ft (3,720m)
Range with maximum fuel:	274nm (315miles, 507km)

APPENDIX II: SPECIFICATION DATA—AH-1T MODEL

Dimensions

Main rotor diameter:	48ft 0in (14.63m)
Tail rotor diameter:	9ft 8.5in (2.96m)
Wing span:	10ft 7in (3.23m)
Length overall (main rotor fore and aft):	58ft 0in (17.68m)
Length of fuselage:	48ft 2in (14.68m)
Width of fuselage:	3ft 2.5in (0.98m)
Height overall:	14ft 2in (4.32m)
Elevator span:	6ft 11in (2.11m)
Main rotor disc area:	1,809.56sq ft (168.11sq m)
Tail rotor disc area:	74.03sq ft (6.88sq m)

Weights

Operating weight empty:	8,608lb (3,904kg)
Maximum take-off and landing weight:	14,000lb (6,350kg)

Performance

Maximum level speed at sea level:	149kt (172mph, 277km/h)
Vertical climb rate at sea level:	301ft/min (92m/min)
Service ceiling:	7,400ft (2,255m)
Range with maximum fuel:	227nm (261miles, 420km)
Combat radius at 138kt (158mph, 255km/h) at sea level:	108nm (124miles, 200km)

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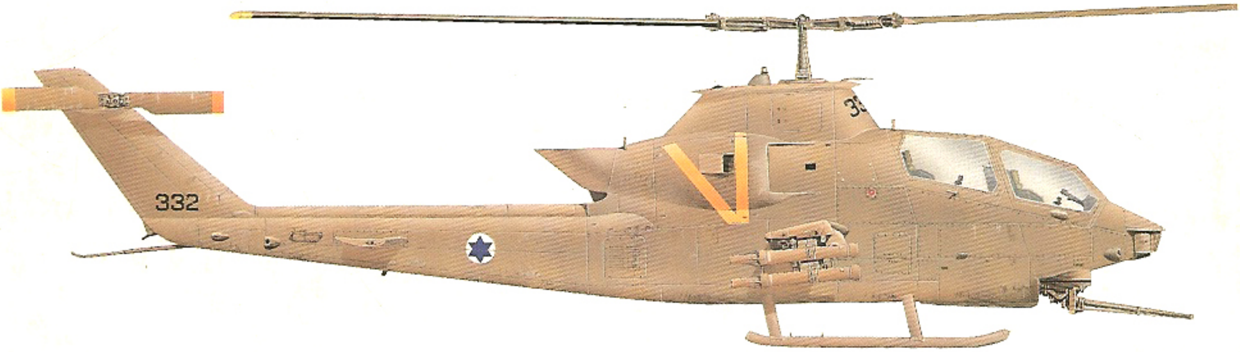

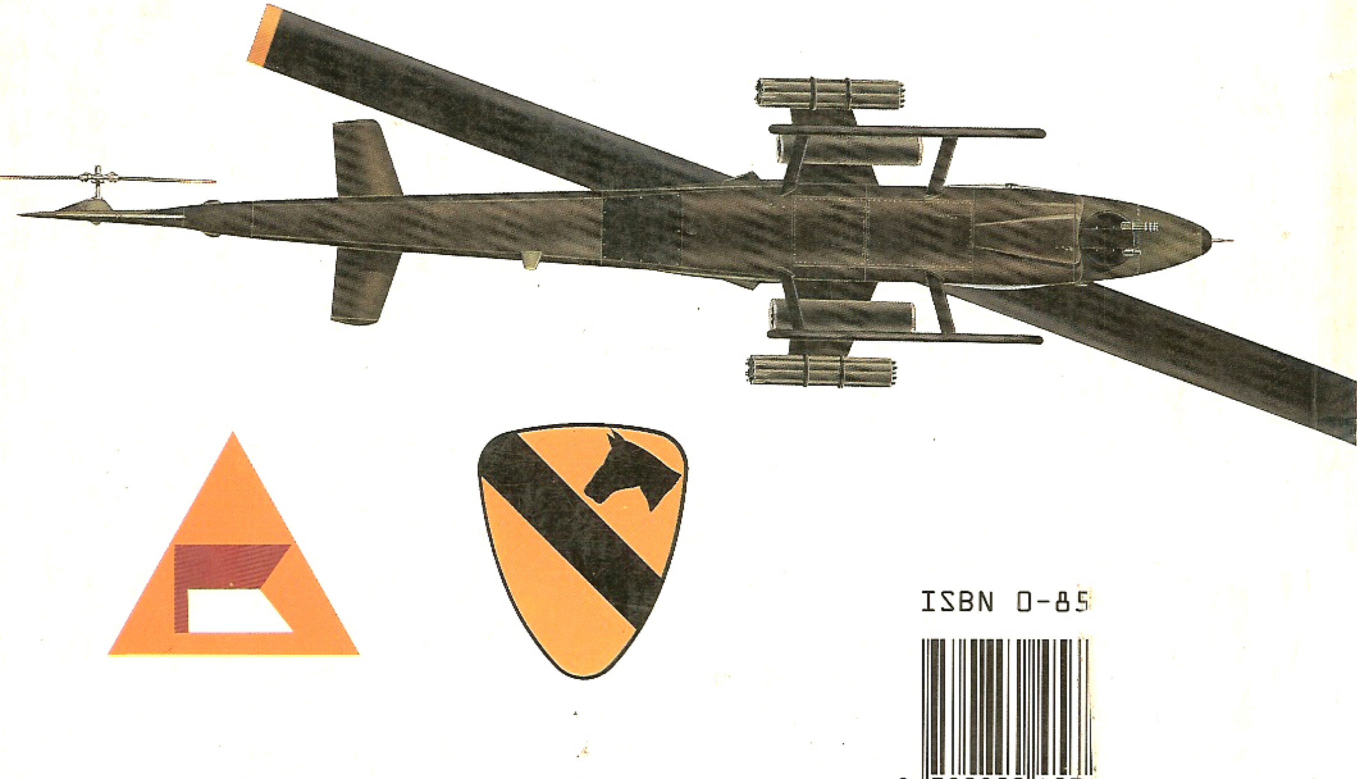

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